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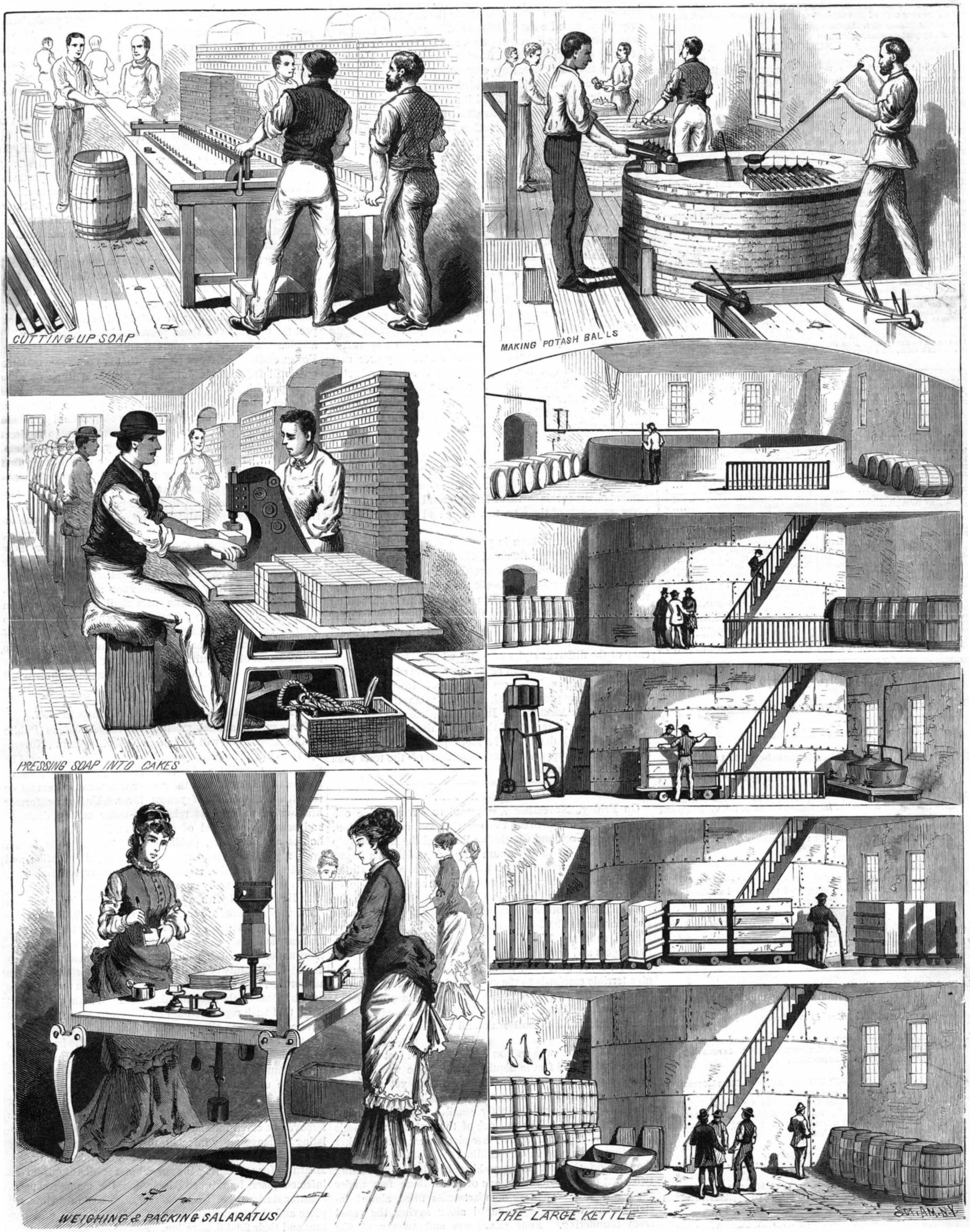

BABBITT'S EXTENSIVE SOAP MANUFACTURING WORKS.—[See page 340.]

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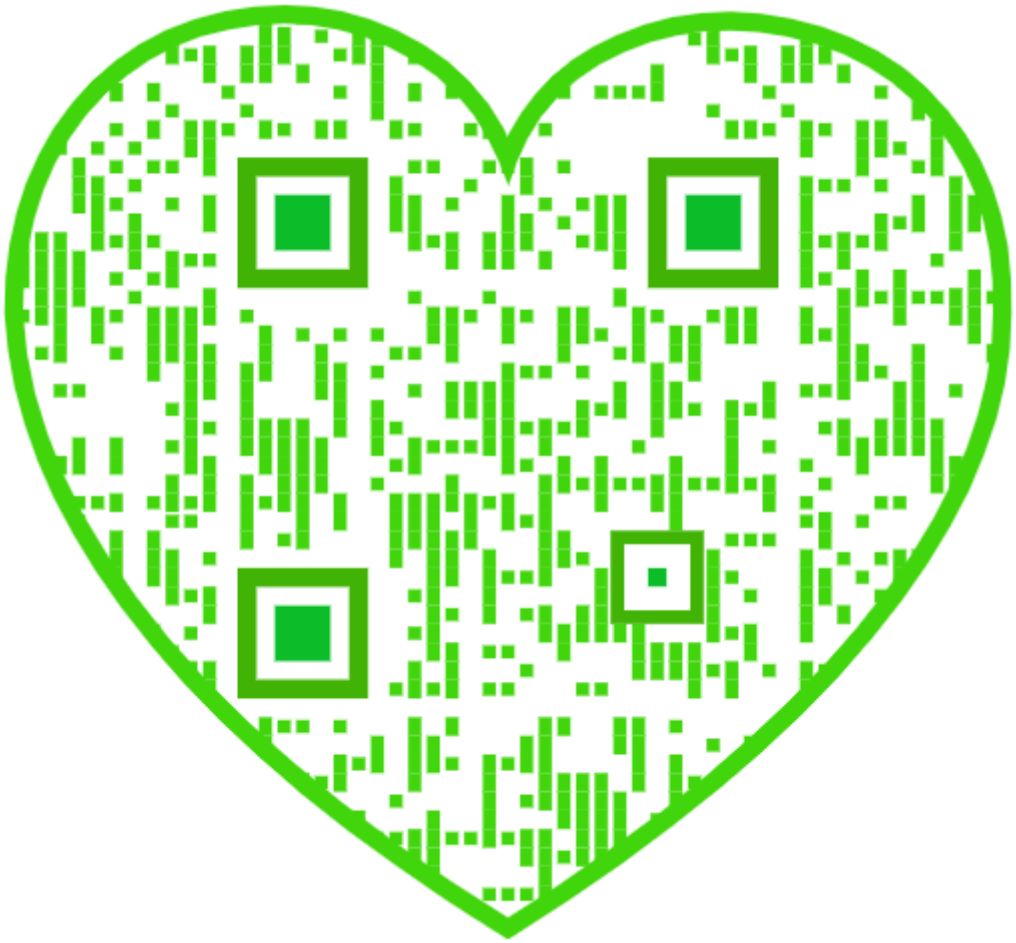

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NEW YORK, SATURDAY, NOVEMBER 29, 1879.

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Compound Three-cylinder Engine of Steamship Orient. 1 large engraving.
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II. ELECTRICITY, MAGNETISM, LIGHT.—M. Jamin's Electric Lamp. 5 engravings.
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Bell Founding.
New Photometer for the Studio. 1 engraving.
Spongy Iron and Animal Charcoal as Agents for the Purification of Water. By L. LEWIN.
Progress of Industrial Chemistry. By J. W. MALLET. Brief review of the most important changes in the industrial applications within the last few years.
Fibrous Rocksalt.
Petroleum and its Examination. An interesting paper read before the American Chemical Society, by A. Bourgougnon. Interesting tables and formulæ. 1 engraving.

THE HOLYOKE TURBINE TESTS.

One of the finest illustrations of the results of New England thrift and energy is to be found in the city of Holyoke, Mass., the great center of paper-manufacture in this country—probably the greatest in the world. The city lies in a bend of the Connecticut River, below the Great Rapids, and is growing with astonishing rapidity in consequence of the unrivaled facilities the place affords for manufacturing enterprises, due to its magnificent, unfailing, and economical water power.

A dam, 1,019 feet long, 130 feet wide, and 30 feet high above the bed of the river, throws the vast volume of the Connecticut into a series of canals lying at three levels, with a total fall of 56 feet. Thus harnessed, the Connecticut yields at this point 30,000 horse power, with several miles of mill sites along its banks and beside the canals. The property is controlled by the Holyoke Water Power Company, who maintain the dam and canal, and lease the water power at a rate so low as to make Holyoke the most promising site for a great manufacturing city using water power this side of the Mississippi. As evidence that these promises are not likely to go long unfulfilled it may be noted that in 1861 the valuation of Holyoke was about two and a quarter million dollars, with a population of eight thousand five hundred. Now the valuation is about ten million dollars, while the population approaches twenty thousand.

In addition to the numerous paper mills there are already established many thread mills, cotton mills, manufactories of silk and woolen goods, extensive machine shops, cutleries, rubber works, besides establishments for the manufacture of screws, wire, and so on. On all sides the visitor sees new buildings going up, particularly new mills, factories, and machine shops, and extensive additions to old ones.

The general basis of the city's growth and prosperity being the utilization of water power, the importance of deciding by thorough competitive tests the relative values of the different styles of water wheels, to establish, if possible beyond a chance for doubt, the best turbine plans, is very naturally a matter of special local interest in Holyoke, apart from the great importance of such tests to all water power users throughout the country. Accordingly the city authorities united last spring with the Water Power Company in an invitation to water power companies, cities that pump their water supply, and all others interested in the matter, to take part in a series of tests of water wheels, at the expense of the Holyoke Water Power Company, with special invitations to the Locks and Canals Company, of Lowell, Mass., the city of Philadelphia, the National Millers' Association, the American Society of Civil Engineers, and the representatives of the owners of the turbines furnished, to send accredited engineers, as guests of the city, to witness and take part in the trials.

These tests have been in progress during the past two months at the testing flume of the Holyoke Water Power Company, which had been enlarged and put in excellent condition for the purpose, making it the most perfect flume of the kind ever constructed. The apparatus used in testing the wheels and the methods employed are those of Mr James Emerson, whose tests at the same flume during recent years have done so much to determine the actual practical efficiency of the different styles of water wheels.

In the course of a month or so the reports of the testing and supervising engineers covering the whole series of tests will be officially promulgated, and will promptly appear in the SCIENTIFIC AMERICAN. In the meantime we shall begin a series of special reports of the tests of the more important wheels, with full details, and a more particular description of the methods, apparatus, and conditions of the tests than is possible at this time.

COLLISIONS AT SEA.

On Friday, November 7, occurred two remarkable collisions at sea, one between the coasting steamer Champion, of the New York and Charleston line, and the English ship Lady Octavia, off the Delaware Cape, resulting in a heavy loss of life; the other between the Arizona, of the Guion line, and an iceberg, while crossing the northern edge of the Newfoundland Banks, no lives being lost. On the following day another steamer, the Falcon, plying between Baltimore and Charleston, was run into by a large three masted schooner laden with ice, and quickly sank, the passengers and crew escaping in life-boats.

These three collisions, occurring almost simultaneously, give terrible emphasis to the ever-imminent risk of such disasters, and the vital importance not only of keeping a good look-out at sea, but of the need of improvements in ship-construction which shall make all vessels practically unsinkable.

The Champion was an iron steamship, 234 feet long, 31 feet beam, and 18 feet in depth of hold. She was built in four compartments, and was lightly laden; yet she filled and sank within five minutes after striking the Octavia. The Lady Octavia was slightly smaller, but much more substantially built. She was one of the first sailing vessels built exclusively of iron, and her plates were much thicker than those now used in shipbuilding. She was struck abaft the stern on the port side, smashing her bows and cutting two great holes in her side, one of them three feet under the water line. The fore compartments filled almost instantly, the watertight bulkhead alone saving the vessel from foundering. Four passengers and twenty of the Champion's crew were picked up, the most of them having clung to floating fragments, or taken refuge on a life raft and in one of the boats which broke away as the steamer was sinking.

The disaster was due wholly to the absence of a proper look-out on board the steamer. The night was clear, the moon was shining brightly, and the captain of the Octavia reports that the Champion was in sight ten minutes before the collision occurred.

The Arizona's mishap was equally inexcusable. With a clear sky and a smooth sea the ship was run head on against a huge iceberg, while going at a rate of fifteen knots an hour. Her entire bow was literally smashed, but fortunately the collision bulkhead was staunch and the vessel was saved It will be remembered that the Arizona was launched only last spring, when a full description of her magnificent appointments was published in this paper

Except in the face of a disaster of this sort it would be impossible to believe that a ship built and run as the Arizona was for superiority in every particular, could have been so recklessly navigated. Her escape from instant sinking, with the loss of every one on board, was almost miraculous. Had the blow been a quartering one, the ripping open of her side would have been all but inevitable, and we should simply have had to record another disappearance of a great ship at sea.

In the case of the Arizona, as in that of the Octavia, the vital importance of collision bulkheads is most impressively illustrated; and indirectly also the value of the compartment system when the partitions are strong and the ports closed. They are not all the conditions requisite for safety, but they go a long way to lessen the risks incident to seafaring—not the least of which would appear to be the criminal carelessness of ship commanders and their assistants.

So long as men, even those in the most responsible positions, are liable to relaxations of vigilance; so long as men in subordinate positions find it less easy to take trouble than to take the chances that no harm will come from their shirking of duty, just so long may we expect the repetition of those preventable disasters, miscalled accidents, which add so many needless terrors to seagoing. For an endless variety of reasons that are no reasons, look outs will fail to look out, and collisions will occur after every provision has been made for preventing them by the use of electric lights, sound-signals, and other contrivances. All these are useful and desirable, no ship should go to sea without them; no officer should be retained who neglects them. But more than these is necessary. The ships themselves must be made with such elements of buoyancy that they will not sink under any probable condition of things at sea. With the enormous actual and prospective increase in shipping, particularly in the department of passenger traffic, the heavy annual losses by shipwreck, and the increasing thousands always at sea and subject to its dangers, the need of unsinkable ships must every year grow more and more urgent. There is no field in which the inventor can more directly contribute to the welfare of men than in this; nor is there any which holds out more generous promises of reward to the men who shall solve the problem involved. The closing years of this century are likely to see as grand an advance in the scope and magnitude of American commerce as recent years have shown in the advancement of agriculture and the mechanic arts. It lies with our inventors to determine whether the commerce of the future shall be secure as well as great.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

The seventh annual meeting of the American Public Health Association will be held in Nashville, Tenn., November 18 to 21. The principal subjects for discussion will be the sanitary condition of cities and towns, especially those of the Southern States, and the proper treatment of actual or threatened outbreaks of yellow fever. Under the former head will come subjects relating to water supply, drainage and sewerage, disposal of garbage and excreta, slaughter-houses and abattoirs, public school-houses, public health laws, regulations, etc., expenses of municipal sanitation, and the like. In the discussion of yellow fever the following points will be specially considered.

1. How to deal with a city in the yellow fever zone in order to prevent the appearance of a first case. 2. How to prevent the importation of a first case. 3. How to deal with a first case and early cases generally when, in spite of precautions under first and second headings, it has made its appearance. 4. The duty of local boards of health, or other health authorities, to report such cases promptly, even though there may be some doubt as to the diagnosis. Whether the knowledge that such reports would be faithfully made would not have a tendency to allay apprehensions, and give confidence to other communities while warning them of the importance of making preparations for contingencies. 5. Under what circumstances may it become necessary or expedient to remove the unacclimated portion of the population from an infected place? How may this be effected for the poorer classes of the population, and how should the people thus removed be cared for and supported? 6. Measures for isolating a dangerously infected place. 7. Organizations for the relief and treatment of the sick in an infected city. 8. Measures for preventing the spread of the disease from an infected place by railroads, including the management of transfer stations. 9. Inspection of steamboats at an infected place and at intermediate stations between the port of departure and their final destination. Should stations of observation be established by the National Board of Health? If so, what should be their relations to the health authorities of the

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States within whose territorial limits they may be established? 10. Results of the co-operation and aid given by the National Board of Health to State and municipal boards under the provisions of the act approved June 2, 1879. What suggestions may be made to render this system more efficient?

During the sessions of the association the National Board of Health will be officially convened. On the 22d the Sanitary Council of the Mississippi Valley will convene, and on the 19th a conference of railway and steamboat managers will consider questions relative to rules and regulations calculated to arrest the spread of infectious diseases through the movement of passengers and freight. On the 17th the Medical Society of Tennessee will meet in special session, and will act as committee of reception. The State Board of Health, the Nashville Board of Health, and the Citizens' Auxiliary Sanitary Association will also contribute to the membership of the committee.

THE USE OF STEEL FOR BRIDGES.

The adaptability of steel as a material for bridges has become a prominent topic of discussion among engineers and bridge builders. In view of the frequency with which pieces of steel of a guaranteed high tensile strength and superior quality have unexpectedly broken, and this in positions that iron has filled much better, has naturally made many engineers skeptical upon the propriety of using it in bridge construction. On the other hand, there are some who are sanguine enough to believe that all that is now necessary, in reference to the introduction of this material, is merely to proceed to use it. The problem, however, is not a simple one; and there are several difficulties to be surmounted, one of the greatest being the want of uniformity of production, the homogeneity of the material. It seems to be understood that high carbon steel, made at the same works from the same materials, differs materially, day by day, in its strength and elasticity, and as a sample out of every bar cannot well be tested, there can be no certainty of just what strength the bridge will possess when the various bars are placed side by side.

Some of the facts that would seem to govern the successful introduction of steel for bridge construction have recently been given in a paper read by Mr. Theodore Cooper before the American Society of Civil Engineers. Mr. Cooper insists on the fact that the engineer who proposes to use steel should not attempt to specify to the manufacturer either its chemical constituents or its manipulation, but should chiefly concern himself with the physical characteristics that the material should possess to best perform its desired work. The most important of these are the tensile strength and elasticity, and which largely represent its suitableness for engineering purposes. The fact is well known that great ductility is accompanied by a low tensile resistance, and *vice versa*. The author points out the importance of requiring a ductile metal regardless of what its tensile strength may be, this ductility to be that of the actual rolled material, and not that of the ingot metal, or samples of the latter worked in a different manner from the material to be used. The amount of tensile strength that can be obtained in connection with a specified percentage of elongation is dependent upon two factors. The first of these, the chemical composition, is only of importance to the user of the material, as it may impart new physical attributes; but even with a knowledge of its accurate composition he is still compelled to depend upon his physical tests to be assured of its quality. The second factor, or amount of work put upon the metal, will be governed by the capacity of the plant by which it is to be worked. Therefore, so large a tensile strength cannot be expected in the heavy sections as in the smaller ones. Competition will soon develop the capabilities of our manufacturers of steel, when a sufficient demand has been created for a steel with definite characteristics suitable for bridge purposes. The following requirements for bridge steel should, in the author's opinion, be the *maximum* as to tensile strength, and *minimum* as to elongation demanded, until increased experience proves the safety of changing them: For plates, angles, channels, and other shapes, an ultimate strength between 65,000 and 70,000 per square inch; elongation not less than 20 per cent in 8 inches; limit of elasticity above 35,000 pounds per square inch. For small bars and rods, an ultimate resistance between 75,000 and 80,000; elongation not less than 20 per cent in 8 inches; limit of elasticity above 40,000 pounds per square inch. For large flat bars, an ultimate resistance between 70,000 and 80,000; elongation not less than 15 per cent in 8 inches; limit of elasticity above 38,000 pounds per square inch. In addition, the steel must be satisfactory as to its hardening tendency, bending tests, etc., with such other practical conditions as may insure a certain and reliable material for the required purpose. He would not deem it advisable to increase the customary working strains used for iron bridges more than 50 per cent. As to the kind of steel, as regards make, that will prove most suitable for bridges, the question must be decided by the relative cost of such material as will fill the requirement; and the latter can undoubtedly be filled by either the crucible, Bessemer, and open hearth processes. The additional cost of smelting would apparently rule out crucible steel, leaving the competition between the two latter processes. Mr. Cooper's paper does not definitely indicate what economy and what advantages may be expected to result in bridge construction from the substitution of steel for iron; but it is, perhaps, impossible to reach any very positive conclusions at present in regard to these matters, owing to the absence of information as to the adaptability and homogeneity of the material. The attitude of engineers on the subject of steel for bridges appears to be one of expectancy, and they seem inclined to put the burden of the proof on the manufacturers, and to require them to furnish evidence of its adaptability and economy before they will consent to use it.

EDISON'S ELECTRIC GENERATOR.

To the Editor of the Scientific American:

A communication in No. 20, page 305, of this volume of your paper, headed "Edison's Electrical Generator," requires a few words of explanation.

Special pains are there taken to imply that the writer of an article on this machine in No. 18 either had been deceived or was trying to deceive others by statements which were made regarding the machine. The writer of the account simply stated that the machine was so constructed that when used at its normal capacity the external resistance should be nine times as great as the internal, so that ninety per cent of the power in the current could be used outside. No fuller statement was made, since Mr. Edison preferred to wait until he had made some improvements that his experiments had shown were necessary. Yet all that was claimed in the article was perfectly true, and has been carefully verified.

The statement that one man could maintain the arc of a Jablochkoff candle was made after trial. It was found by careful tests with a Prony dynamometer that a man could exert for a short time about one-half a horse power, and that for the same time he could maintain an arc equal to that from a Jablochkoff candle. This test was made for the purpose of showing beyond all question that the power requisite for a good light need not be very great.

In illustrating the action of electricity in the circuit, Dr. Seeley wisely remarks and kindly explains how that "beasts of burden and other rational creatures redouble their efforts when their burdens are increased, while electricity behaves very differently, as there are no moral suasions or reserved forces behind it." Yet the learned doctor of philosophy, in saying this, reminds one of the bright scholar he mentions, "whose vision, though very clear, is not so wide, who is quick to spy out a thing, yet does not observe its environments." It seems never to have occurred to the doctor that it is in the power of the maker of the machine to exert this "moral suasion" on the wire covering the armature, so that it shall be more effective and redouble its exertions when greater resistance is offered for it to overcome.

Suppose, for example, a machine was made so as to run on short circuit having one unit of resistance within the machine from, which was given off a certain amount of energy. If the wire on the armature could be made four times as efficient, three units of resistance could be placed outside, and yet each unit would give off the same energy as did the one in the machine in the first case. If the wire could be made nine times as efficient nine times the resistance could be placed in the circuit and still have each unit as active as in the first case. Mr. Edison, by using large magnets, has done this; that is all he claimed, and all that the writer of the article which provoked this discussion expressed. He was perfectly aware of the fact that the friction of the machine and local action counted more in proportion as the resistance in the circuit was increased. Yet he felt contented so long as the tests which I made for him showed that less was lost than in any other machine in transferring mechanical into electrical energy. His machine is so made that it would be impossible to use it with the same resistance outside as inside, as it would heat the wire on the armature so as almost to burn it, by carrying a current so much in excess of that for which it was intended.

The reader, whom Dr. Seeley advises so glibly to wrestle with Ohm's law until he has mastered it, may when he begins take the doctor as a pupil and show him that he has wrongly applied the simplest equation, expressing it $C = E R^{-1}$. "I am grieved to observe that many people who talk and write glibly about electricity do not understand it," and no better illustration can be found than in a doctor of philosophy deliberately stating that current and foot pounds are the same, or that energy is directly proportional to the current. Foot pounds are always measured by the square of the current, and the method of measuring is analogous to that employed for measuring the energy in a stream of water. For if twice the amount of water flows from a given sized jet against a turbine, it will be able to do four times the work, for each particle of water will be moving twice as fast and thus be twice as energetic, and there will be two times as many of them. Although Dr. Seeley has used the water analogy he has failed to see its "environment."

Dr. Seeley's distinction of outside from inside current seems to me ridiculous, for it is exactly similar to saying that an endless wire rope running from a building out of doors has an outside and an inside velocity. The current means the rate of flow of electricity, and must be the same for the whole circuit, so that the "outside and inside currents" must always be the same.

In conclusion, I may state that the methods which are employed for testing Mr. Edison's machines were fully described in a paper read by me at the Saratoga meeting of the American Association. At that time, as now, full results were withheld until Mr. Edison was fully satisfied with the performance of his machine.

To show the line of experimenting he has chosen, it may be mentioned that he hopes soon to have a machine with only one-eighth of an ohm in the armature, which he will use with an external resistance twenty times as great, and which shall give with less than one-tenth of a horse power on the magnets an electromotive force of 100 volts.

FRANCIS R. UPTON.

Laboratory of T. A. Edison,
Menlo Park, N. J., Nov. 11, 1879.

HOW FAR CAN WE HEAR WITH THE TELEPHONE?

This is a question frequently asked, but we believe has not yet been definitely settled. The longest distance that we have seen mentioned is given in the item below, namely, two thousand miles. But perhaps Mr. Edison has had more extended experiences. If so we should be glad if he would let our readers know.

An exchange states that Mr. Robert A. Packer, superintendent of the Pennsylvania Railroad, is at present hunting with a party of gentlemen in Nebraska. A few days ago he for two hours conversed pleasantly with his wife and friends at Sayre, Pa., his brother at Mauch Chunk, Pa., and friends along the line. The medium was the railroad and Western Union Telegraph wires and Edison's telephone. At the office in Bethlehem, Pa., connection was made with the Easton and Amboy wire, and at Perth Amboy with a Western Union wire, and thence to Chicago and North Bend, Nebraska, where the party are. The distance was about two thousand miles, and every whisper was audible.

Professor Proctor's Lectures.

In the first two of his series of lectures on astronomy, at Chickering Hall, Prof. R. A. Proctor has amply sustained the favorable impression made both by his previous lectures here and by his numerous writings. His manner is pleasing, and he has a happy faculty for incorporating in his lectures the latest and most interesting of astronomical observations, deductions, and theories. In his first lecture, Nov. 10, he dwelt upon the beauty and glory of the heavens, the subject as announced being the poetry of astronomy. The second lecture—Nov. 13, on the immensity of space—gave opportunity for a very interesting and instructive review of the dimensions and characteristics of the solar system, the transit of Venus, and the evidence it afforded as to the distance of the sun, and the dimensions of the members of the solar system, cometic theories, the milky way, star distances, and other aspects of astronomical observation and speculation. The third lecture will be on the vastness of time as revealed by astronomy; and the last will treat of other worlds and other suns. The excellent stereopticon illustrations accompanying these lectures add materially to their value and interest.

Crude Petroleum as a Remedy in Consumption.

Dr. M. M. Griffith, of Bradford, Pa., reports some astonishing results obtained by the administration of crude petroleum to consumptives. He claims that out of twenty-five cases of well marked tuberculosis so treated twenty are to all means of diagnosis cured; the rest have been materially benefited; and none have been under treatment more than four months. The nausea attending the use of ordinary crude petroleum led him to adopt the semi-solid oil that forms on the casing and tubing of wells. This, made into three to five grain pills by incorporating any inert vegetable powder, was administered from three to five times a day in one pill doses. The first effect, he says, is the disappearance of the cough; night sweats are relieved, appetite improves, and weight is rapidly gained.

It is to be hoped that Dr. Griffith has not mistaken some self-limiting phase of throat or bronchial disorder for true consumption of the lungs; also that continued trial of the alleged remedy will justify the high opinion he has formed in regard to its efficacy.

The Highest Inhabited Houses in the World.

In this country, a miner's house on Mount Lincoln, Colorado, is 14,157 feet high. In Peru, a railway village, called Galera, is 15,645 feet high. Near this place is the celebrated railway tunnel of La Cima, which is being bored through the peak of the mountain. The tunnel is 3,847 feet long, and is located 600 feet above the line of perpetual snow.

A Proposed Offer of $10,000 Reward.

With reference to ginning and spinning in the Southern States, a resolution was lately adopted by the State Agricultural Society and Grange, of Chester, N. C., to ask the State Legislature for a reward of $10,000, to be paid for an invention which will enable farmers, upon their plantations and at paying rates, to convert their crops from the seed into yarns.

The principal object in view is to direct the attention of farmers and inventors to the want of such a machine, as well as to the practicability of perfecting it. Such machines can be had even now, but they are too costly and large for farm use, and this it is desired to remedy.

THE British Consul at Panama reports that India-rubber has almost ceased to be an article of export from the isthmus, mainly in consequence of the great difficulty and expense of getting at the trees in the remote districts of the interior. Those nearer the coast have been destroyed by the wasteful system pursued by the natives in cutting down the trees to procure the sap.

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A NEW VELOCIPEDE.

We give herewith an engraving of a new velocipede recently patented by Mr. S P. Ruggles, of 1209 Washington street, Boston, Mass. It is designed especially for the use of young girls and misses as a means of out-door exercise and amusement, and for developing the muscles of the lower limbs, and in fact of the entire body.

The velocipede is provided with two seats, one for the operator and the other for the passenger. These seats, which resemble a part of an ordinary cane chair, are mounted, one in front of the other, on a frame that is supported at the rear by a caster wheel, and in front by the axle of the drive wheels. Below the axle there are two levers or pedals, which are pivoted to the main frame below the rear seat, and are provided with stirrups for receiving the feet of the operator.

Two cranks, formed in the main axle diametrically opposite each other, are provided with thimbles, around which pass the straps connecting the cranks with the pedals. The caster wheel is provided with a transverse arm, which is connected with two guiding levers placed on opposite sides of the main frame.

The operator, sitting in the front seat, takes one of the guiding levers in each hand, and presses first one pedal and then the other in alternation with the feet.

The movement is easy, and the sport is healthful and enjoyable.

RUGGLES' VELOCIPEDE.

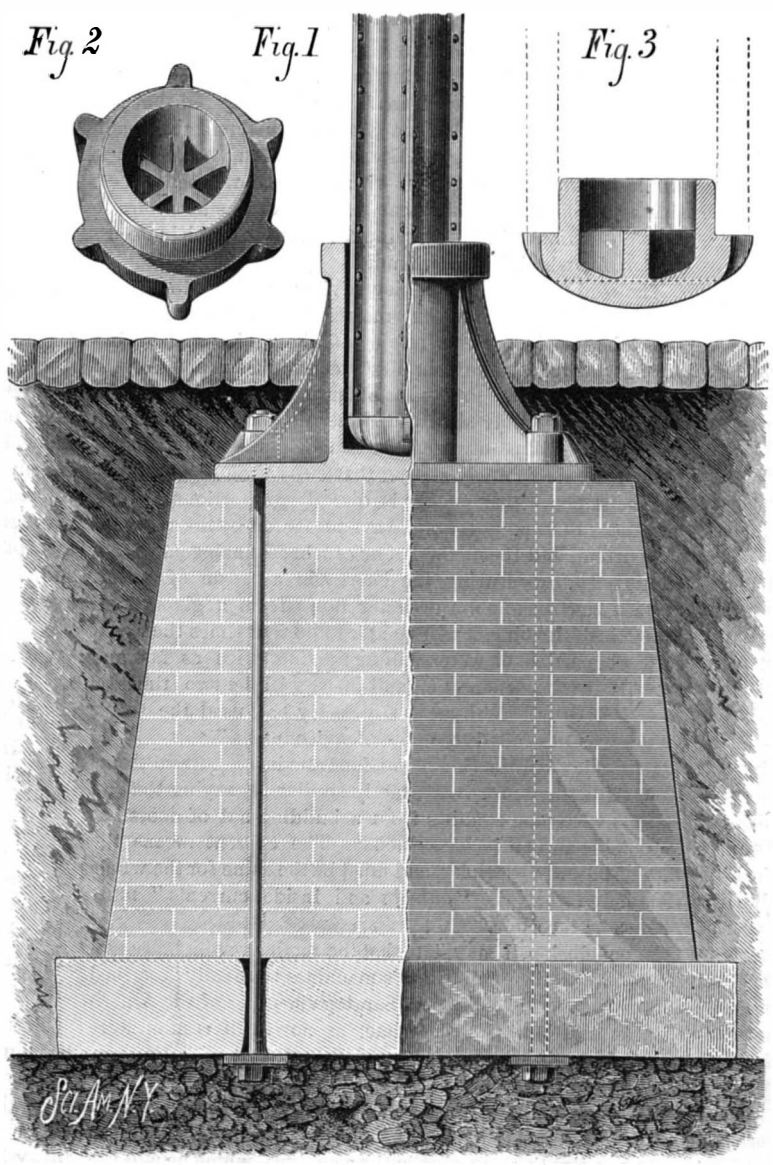
The Induction Coil.

Reviewing the new edition of "Noad's Text Book," the *Journal of the Telegraph* says: "The invention of the induction coil is credited to MM. Masson and Breguet, in 1842." As a matter of fact, the first induction coils were made by Professor C. G. Page, then of Salem, Mass., in 1837-8, consisting of a long secondary wound over a short primary coil, having a bundle of iron wires for its core, and provided with an automatic circuit breaker. They were capable of giving sparks in free air, as well as shocks and other indications of high potential. The fact that descriptions of this apparatus were published in the scientific journals of the day leaves no adequate excuse for the persistent omission of many European authors to give the credit of this apparatus to the American inventor to whom it rightfully belongs.

NEW FOUNDATION PLATE FOR ELEVATED RAILWAYS.

In a recent article on the progress of the elevated railway we gave an illustration of the foundation plates used in connection with the latticed columns on a portion of the structure. We give herewith an engraving of the combined bed plate and spherical bearing used on that part of the railway built by Clarke, Reeves & Co., of Phœnixville, Pa. It will be seen by reference to the engraving that the socket which receives the lower end of the iron column is concaved at the bottom to receive a convex bearing piece upon which the column rests. Fig. 1 in the engraving shows the iron socket plate—partly in section—in its position on the brick foundation. Fig. 2 is a detail perspective view of the bearing piece, and Fig. 3 is a vertical section of the bearing piece. The object in using a foundation plate of this kind is to secure a full bearing of the column on the bed plate under all circumstances. Without this device the column would, in many cases, rest upon one of its edges only. This may occur when the foundation plates are not exactly level, or when they are inaccurately placed and the column has to be tipped a little in one direction or the other to bring it into the required position at the top. The spherical socket and bearing piece admit of moving the column one way or the other without affecting its bearing in the base plate.

Messrs. Clarke, Reeves & Co. inform us that they have used this device in the construction of more than 120,000,000 lb. of elevated railway for New York city.



ELEVATED RAILWAY FOUNDATION PLATE.

The Best Goods Always Pay the Best.

The truth of this statement is simply verified by the experience of every observing merchant. It is not the poor and trashy stuff, put up in a cheap and nasty style, even with a very wide margin of profit, that pays the best. There may be done in some of these catch-penny goods for a short time a money-making business. That we do not deny. We have seen it in novelty articles of various descriptions. We have seen it in largely adulterated coffees and spices; in honey and sirups; in candies, and canned goods. But the end has come, over and over again, to all these meretricious methods of money making on merchandise. Sometimes the inevitable is averted for a long time by factitious plans of selling by prizes of clocks and spoons, by rapidly changing from one brand to another, by constantly shifting the field of operations, and by a hundred and one ways that will not stand the test of legitimate business methods. Call to mind the goods in the market, however, that have become established and staple, and in every case they will be found to be the products of manufacturers who have made it a cardinal principle in their business to make only the best goods, and while the margin of profits is necessarily small, the stability of the market and the permanency of the demand enable their proprietors to rely upon them for an income as regular and steady as if they were government bonds.—*New York Grocer.*

MISCELLANEOUS INVENTIONS.

An improvement in grain meters has been patented by Mr. Joseph Nurnberger, of St. Albans, West Va. It consists of a double-ended vessel pivoted to the scale beam under the grain spout, a pawl and ratchet connected with the scale beam, a register, and a stop device for holding the vessel, whereby, when the quantity to be weighed and registered each time is admitted to the vessel, it turns the beam, releases the vessel, which reverses by its own gravity, empties the grain, and turns the empty compartment up under the spout, and at the same time the pawl moves the index on the register.

An improvement in folding mirrors has been patented by Mr. Nicholas F. McEvoy (Catherine McEvoy, administratrix), of Millbury, Mass. Two or more mirrors are mounted upon a standard and adapted to be placed in different positions or at different angles to each other.

An improved adjustable pillow-sham holder has been patented by Mary E. Smith and George B. Fay, of Brooklyn, N. Y. It consists of a tube provided with slots and spiral spring, and made adjustable as to length so that it may fit any bed. It is attached to the head board, and is designed to hold the pillow shams in the proper position.

Mr. Jacob Weart, of Jersey City, N. J., has patented an air forcing and carbureting apparatus for illuminating railway cars. A carbureter is placed on the car and suitably connected with the burners. A blower is connected with the carbureter, and a steam pipe leads from the boiler and connects with a coil located on the car, beneath or contiguous to a coil of the air pipe.

Mr. Isaac D. Fegely, of Shamrock (Long Swamp P. O.), Pa., has patented an improved hand pump of cheap and simple construction that, it is said, can easily raise water from a depth of one hundred feet or more.

Mr. Henry F. R. F. Somerset, of Badminton, county of Gloucester, England, has patented an improvement in loops for connecting stirrup straps to the saddles, the object being to provide for automatic disconnection of the strap in case of accident. The invention consists in a stirrup loop formed with two sides hinged or pivoted, and retained in position by spring pressure under ordinary circumstances, the hinged sides being held in such manner that the parts are released and the loop thrown open by the draught caused by the rider being thrown.

Mr. J. Theodor Schultz, of Uhlenhorst, near Hamburg, Germany, has patented an improved machine for cleaning and polishing boots and shoes. It is so constructed as to do its work rapidly and well, and it is simple in construction and convenient.

An improved mining-drill has been patented by Mr. Fred. B. Parrish, of Wilkesbarre, Penn. The invention consists in combining, with a drill-shaft arm having slotted recessed jaws, and a crank-screw on the auger, a pivoted nut having pins on opposite sides and made solid.

Messrs. Richard Hudson, of Chorlton cum Hardy, Henry Grimshaw, of Manchester, and Christopher Cronshaw (executor of John Briggs, deceased), of Bolton, County of Lancaster, England, have patented an improvement in ornamenting or transferring patterns to fabrics, printing the patterns with any bituminous substance or varnish of any color on the pattern paper, and transferring them to the fabric by the application of heat.

Mr. Mott G. Gillette, of New York city, has patented an improved tap valve for barrels which will effectually close up the tap hole and prevent the entrance of air, but at the same time does not interfere with the insertion of the faucet. It consists of an annular collar placed around the tap hole on the inside, which forms a seat for a flap valve (opening inwardly) hinged thereto and governed by a spring.

An improvement in ornamental hat bands has been patented by Marcus Goldberg, of New York city. The invention consists in a hat band formed of two or more spiral springs, placed one upon the other, and held in place by metal clasps, and also in the combination, with the springs and clasps, of tapes or cords, so that the band can be placed upon different sized hats, but cannot be expanded so much as to injure the elasticity of the springs.

An improvement in combined fire alarm and fire extinguisher, invented by Mr. John W. Smith, of Brooklyn (E. D.), N. Y., is designed to furnish an improved device, to be connected with a system of water pipes in a building. It is so constructed that should a fire occur the fire itself will open a vent for the water where the fire is, and in no other place, and at the same time will sound an alarm.

Mr. Harrison T. Rook, of Hot Springs, Ark., has invented an improved car coupling having a drawhead composed of two parts, forming what may be called a pair of jaws, of which the one is movable and the other fixed. The movable jaw is pivoted on a pin in the fixed jaw, so that when the connecting pin, which has a conical head on each end, is thrust into the opening of the draw head, the movable jaw lifts to receive the connecting pin.

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A NEW SWEEPER.

The annexed engraving represents an improved sweeper recently patented by Mr. R. G. Pittman, of Rocky Mount, N. C. It is designed for sweeping streets, lawns, walks, floors, or carpets, and is provided with an adjustable brush which may be used until it is worn out; its driving gear, which is large and efficient, is placed entirely outside of the sweeper case.

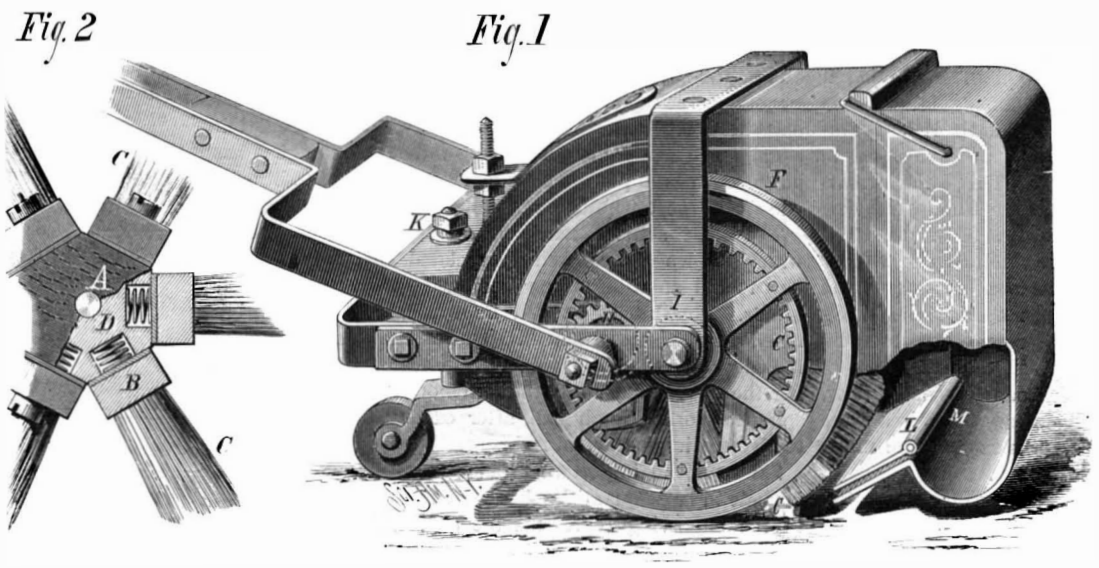
Fig. 1 is a perspective view of the sweeper, with parts broken away to show internal parts, and Fig. 2 is a detail view of the brush.

The drum, A, is provided with sockets containing spiral springs attached to the bars, B, which carry the brushes, C. The springs are retained under compression by screws at the ends of the bars, B. As the brushes wear, the screws are retracted, allowing the springs to expand and carry the brushes outward.

The brush is supported by the axle, D, upon the ends of which there are wheels, F, provided with rubber tire. These wheels revolve loosely on the axle, and one of them has attached to its inner side an internal gear wheel, G, that gears into a wheel, H, which revolves on a stud projecting from the sweeper frame, and meshes into a pinion, I, on the end of the drum, A.

The rear portion of the sweeper frame is supported by a caster wheel, and the front carries a dust receptacle, M, which is suspended from the front of the brush cover, and may be readily removed when filled. The dust receptacle is provided with a hinged apron, L, that nearly touches the floor, and guides the dust into the receptacle as it is thrown up by the brush.

Among the several good features possessed by this sweeper, perhaps the most noteworthy are the adjustable brush, the large driving wheels, and the removable dust pan.



PITTMAN'S SWEEPER.

Bamboos as Food.

The young shoots of the bamboo, according to *Les Mondes*, form in Japan one of the principal aliments of all classes of people during the spring and a portion of the summer. Those gathered on poor soil are hard and but little esteemed; but those, on the contrary, which grow in rich soil and under careful culture, are large, quite tender, and even suit the palates of a large number of Europeans. Their quality naturally lessens where they grow on mountains; and yet they are edible even at altitudes where the plant does not succeed so well as it does in Provence. For this reason, the journal above mentioned thinks there is reason to hope that this valuable article of food will be introduced and successfully cultivated in the south of France. To form a forest of edible bamboos, the country people in the vicinity of Kioto begin by breaking up the soil to a depth of about three feet, and then plant therein two-year old bamboos of a species called "Moso." The latter are then cut back to a height of about nine feet, and the plantations are afterward kept carefully free from weeds for two or three years. No crop is gathered till after the fifth year, and then only sparingly, since the forest does not attain its full growth till ten years after planting. At the latter period the annual crop is said to amount to 22,000 pounds of young shoots per hectare (2½ acres). The importance of this product leads the peasantry (who undertake the culture near large cities) to devote very good lands to it, and to manure them thoroughly in order to obtain early crops. Every year a new shoot appears on each spreading root, and the old plants, which no longer yield scions, are cut down. If care be taken not to exhaust it, a forest will renew itself indefinitely. The culture of the plant requires the use of much compost, and the plantations are also watered every year in the months of February and September with liquid manure. It is due to constant care and trouble of this kind that tender and delicate products are obtained. The stems that are allowed to grow attain considerable dimensions, often reaching a height of 24 feet, and a circumference of 35 inches at their swollen base.

Changes in Epicurean Tastes.

It is curious, says an English journal, to observe the change of taste that epicures have experienced with regard to different birds. Even to-day the tastes of two neighboring people—the English and the French—are much more unlike in this respect than one would imagine. In England, for example, the goose is held in almost as much esteem as the turkey, while across the channel the former is sold at scarcely half the price of the latter, and is regarded as nothing better than a vulgar dish. But if we compare our present habits with those of seventeen or eighteen centuries ago, the contrast will be much more remarkable still.

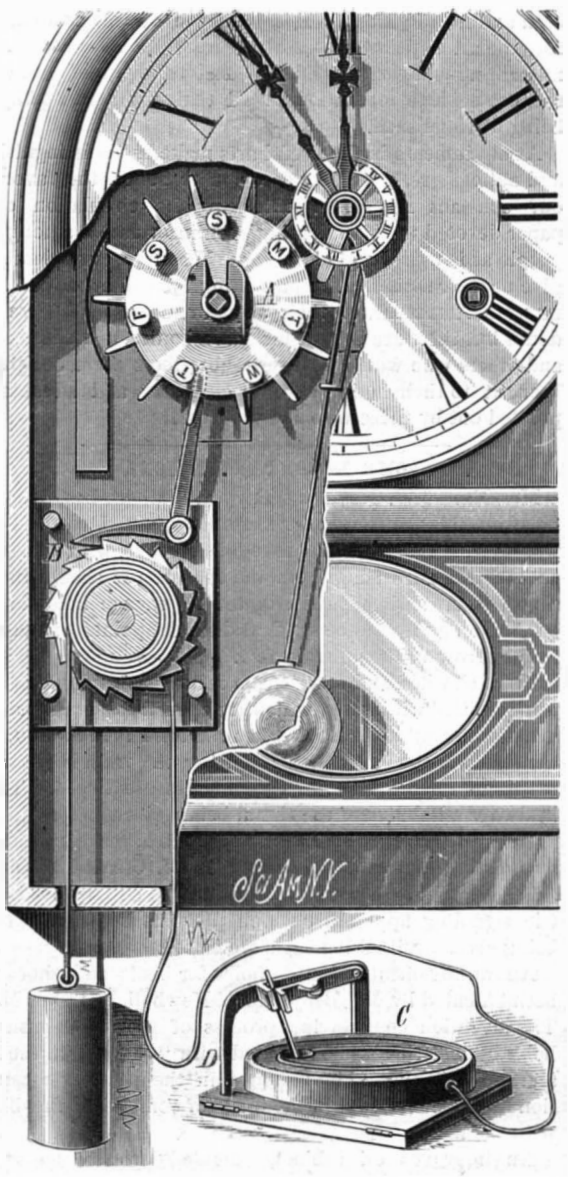
To-day we never see a poulterer's shop adorned with rows of peacocks, and should one of these beautiful birds appear upon the table at some grand public or private dinner, none of the guests would go into ecstasies over the dish, as if its delicacy was a fact universally known. But at Rome, no banquet was complete without the presence of the peacock. Among the other large birds, the cranes, the swans, and even the ostrich, were held in high esteem. Geese were also highly prized, and they were eaten not with a sauce, but stuffed with small green apples. The duck and teal were served with the juice of the orange and not that of the lemon, and they were preferred to the heathcock and woodcock. As for larks and thrushes, they were usually eaten at the end of the meal, with the idea, true or false, that it would prove a sovereign remedy against affections of the bowels. But the bird most in esteem among all the subjects of the Cæsars was the common thrush. These birds were raised and fattened in large establishments near Rome, and brought very high prices. The artificial rearing of these birds, which are excellent for the table, would prove an easy matter.

Hog Cholera.

Dr. D. N. Kinsman, Professor of the Practice of Medicine in the Columbus Medical College, has been making an elaborate study of this disease, by which, he states, $20,000,000 are lost annually in the United States. He concludes that the affection is a specific, contagious disease, peculiar to the species, and always accompanied with extensive peritonitis. It is not, as has been claimed, any form of anthrax or typhoid fever.—*Medical and Surgical Reporter.*

NEW AUTOMATIC FIRE LIGHTER.

A novel device for lighting fires automatically at any prescribed time has recently been patented by Mr. E. H. Dorscher, of Homestead, Iowa. It is intended for the use of housekeepers, country school teachers, manufacturers, and others who require a fire at a stated time. When this device is used personal presence is not required; all that is necessary is to prepare the kindlings and fuel beforehand and set the apparatus. By reference to the engraving it will be seen that the mechanism is controlled by a clock, upon the hour hand arbor of which there is an adjustable disk similar to that of an alarm clock, which carries an arm capable of engaging pins projecting from the periphery of the wheel, A. This wheel carries seven pins corresponding with the seven days of the week, and arranged so that they may disengage a pawl from the ratchet wheel, B, at any prescribed time in the day. The ratchet, B, is upon the shaft of a small windlass that is propelled by a weight when the pawl releases the ratchet wheel. This windlass winds a cord that may be extended in any direction to the stove or furnace where there is a lighter, C, consisting of a horizontal wheel, around the periphery of which is wound the cord from the windlass, and upon the upper surface of which there is a coating of sand or sandpaper. The wheel is protected by an iron cover, which also supports a clamp, D, for holding one or more matches, so that they press lightly upon the sanded surface. A piece of paper or other combustible material extends from the match to the kindlings in the fireplace. The operation of this apparatus is obvious. At the prescribed time the pawl is released, the weight drops, the sanded wheel revolves, and the fire is lighted. If it is desired to skip a day or so, the pins in the wheel, A, which represent the days to be skipped, are removed.



DORSCHER'S FIRE LIGHTING APPARATUS.

Sanitary Conventions in Michigan.

At a recent meeting of the Michigan Board of Health arrangements were made for the holding of two sanitary conventions in that State the coming winter. The first is set down for the second week in January, and will be held at Detroit; the second, at Grand Rapids, will be held in February. The subjects for discussion at Detroit will be: Abattoirs for cities; school hygiene; ventilation of living and sleeping rooms; cooking schools; plumbing for dwellings; prevention and limitation of contagious diseases; inspection of food; water supply for the family. At Grand Rapids the subjects will be: Public interest in and importance of general sanitation; school architecture in respect to its hygienic aspects and importance; sewerage, its importance, its benefits, and its dangers; sanitation of the sick room; infection, the every-day dangers of it and how to prevent it.

Accompanying these conventions will be a free exhibition of sanitary appliances, which manufacturers are invited to send. Articles of exhibit will be received by the secretary of the convention, at Detroit, by Dr. C. H. Leonard, 50 Lafayette avenue, from December 15, 1879, to January 6, 1880. The time for entering articles at Grand Rapids has not yet been determined. The judges will be invited to examine the articles exhibited, and certificates of merit will be awarded.

Harrington's Muffling Contrivance.

In our recent notice of inventions connected with elevated railways, on exhibition at the Mechanics' Institute Fair, that of Mr. John R. Harrington, of Brooklyn, was unintentionally omitted. Mr. Harrington's invention consists in a fibrous packing interposed between the base of a rail and the ties, also between the tops of the flange of the rail, and secured by caps of wood to protect the packing from the weather and against fire. Mr. Harrington also muffles the floors and sides of cars with the same material. The inventor informs us that the method is about to be put to practical test on a considerable length of elevated road.

In the course of experiments with Bower's process for coating iron with magnetic oxide by a current of hot air, it was found, Mr. G. R. Tweedie says, that the action was due to the combination of atmospheric oxygen with the carbon of the iron to form carbonic anhydride, which was then reduced by the iron according to the well known equation $4CO_2 + Fe_3 = Fe_3O_4 + 4CO$. Hence this process was found to be unsuitable for coating wrought iron or steel. The mode of procedure now adopted is to heat the articles to be coated in a current of impure carbonic anhydride, obtained by the combustion of small coal. By this means a coating of magnetic oxide is obtained slightly contaminated with red oxide, the conversion of which into magnetic oxide is then effected by adjusting the air supply of the furnace, so as to substitute a current of carbonic oxide for the carbonic anhydride, $3Fe_2O_3 + CO = 2Fe_3O_4 + CO_2$. The coating thus produced is very hard, homogeneous, and withstands ordinary oxidizing influences.

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AMERICAN INDUSTRIES.—No. 24.

SOAP MANUFACTURE.

Soap is by no means a modern invention; it is so old that no one can tell when or where it originated. Specimens of it were found in the ruins of Pompeii, together with the apparatus for its manufacture. It is not our purpose to give a detailed history of this industry nor to describe generally the processes by which the great variety of soaps now found in the market are made, but to give the reader an idea of the apparatus and processes employed in the largest soap manufactory in this country, if not in the world.

Crossing the North River on one of the ferries one cannot fail to notice in the lower portion of New York city a building much higher and wider than any of the others, upon which is displayed in huge letters the name of B. T. Babbitt. The stranger might be at a loss to know whether the great manufacturer had chosen this as a conspicuous place to post his advertisement after the modern fashion, or whether it really designates the spot from which emanate the products so familiarly known all over the world; but the latter is correct. B. T. Babbitt's soap works occupy an area equal to twenty-three city lots, 25x100 feet each. This immense surface is covered with substantial brick buildings, ranging from three stories to five and eight stories in height. The aggregate floor space devoted to manufacturing is 300,000 square feet. These buildings are located on Washington and West streets; the numbers on Washington street comprising Nos. 64 to 84 inclusive, and on West street Nos. 41 to 51 inclusive.

The business offices of the concern occupy a large floor, and in connection with the establishment there is a large restaurant, where employes of the works can procure meals at reduced prices and without loss of time.

The power used in these works is furnished by twenty-five engines placed wherever power is needed, and supplied with steam from four boilers of Mr. Babbitt's own invention, ranging from 500 horse power to 60 horse power. By this arrangement long lines of shafting are avoided and the power is applied directly.

For carrying out his plans for the construction of boilers and machinery, Mr. Babbitt has extensive machine shops at Whitesboro, N. Y. Everything connected with the establishment is upon such a grand scale that it is impossible to realize the extent of the works without personal inspection.

The amount of raw material consumed in these works is astonishing. The annual consumption of some of the leading materials includes upward of 70,000 barrels of the purest white tallow, received principally from Texas; 40,000 barrels of resin from the Carolinas; immense quantities of potash are imported from England, and vegetable oils and other ingredients are consumed in proportion. All of the materials are selected with the greatest of care, and nothing but the first quality is ever bought. Notwithstanding the immense quantity of materials used in this establishment, one cannot discover the slightest disagreeable odor in making a tour of the entire works, and the most scrupulous cleanliness is everywhere observable.

In the manufacture of soap Mr. Babbitt employs six enormous caldrons made of boiler iron; the largest, which is shown in one of the views on our first page, is 25 feet in diameter and 57 feet in depth, holding 1,800,000 pounds at a single boiling. The aggregate capacity of these huge receptacles exceeds 3,500,000 pounds. The average cost of the raw materials for filling each kettle for a single boiling is $36,000, while the value of the contents of the largest caldron reaches the enormous sum of $125,000. Everything here is subject to regular system. Nothing is wasted, nothing neglected. The gigantic operations proceed with perfect regularity. Wherever possible machinery has been introduced to save labor.

The foundation of nearly all varieties of soap is pure white tallow, which is received in barrels or casks. It is transferred to the soap kettles by placing a large number of the barrels in line upon a platform with the bung downward, and introducing steam pipes, the steam from which quickly melts the tallow, when it flows into large reservoirs, and thence to the kettles. The lye, composed of potash and lime, is prepared in large iron tanks, and conducted through pipes to the kettles. After the tallow and lye are thoroughly mingled, steam is admitted to the kettles, and the boiling begins. At a certain stage in the process common salt is added, which, dissolving in the lye, increases its density, and permits the soap to float on the surface of the liquid. It requires several days to complete this process. When it is finished, the liquid soap is drawn off, and forced by means of powerful steam pumps into large iron reservoirs, from which it is drawn through pipes into the soap frames to cool and harden. The kettles are filled in regular rotation, so that while one is boiling, the process has nearly approached completion in another, while a third is being emptied.

The average daily production of the works is about 1,500 boxes of soap, each containing 75 pounds.

The soap frames above alluded to are shallow iron boxes, made separable to facilitate the removal of the soap. Each frame holds about 1,500 pounds. After the soap has hardened sufficiently it is cut into bars by means of wires, and is afterward pressed into oblong cakes, with rounded corners, without loss of weight, and at the same time receives its imprint of "Babbitt's Best Soap," a brand which is universally recognized as a guarantee of excellence.

The description given above is applicable to the manufacture of nearly all varieties of hard soap, except the choicest kinds of toilet soap, in which pure vegetable oils take the place of tallow, or are used in combination with it. Olive, palm, and cocoanut oil are the most generally used for fine soaps. A considerable portion of Mr. Babbitt's establishment is devoted to the manufacture of toilet soaps, and in this, as in the manufacture of ordinary bar soaps, nothing but the best materials are used.

The frauds which have been perpetrated under the cover of perfumes by unprincipled manufacturers have created a distrust of the highly scented soaps, and made a demand for a wholesome soap free from such objections. Mr. Babbitt, with his characteristic enterprise, met this increasing popular demand, by introducing an elegant article of toilet soap which is entirely free from artificial odor of any kind. It is made from the finest of vegetable oils, by new and original processes. "Baby Soap," as this new article is called, is peculiarly suited to the delicate skins of infants, children, and ladies. It preserves, softens, and smoothens the skin, and is an elegant toilet luxury, not only well adapted to the use of ladies and children, but equally well adapted to gentlemen's toilet. Although it has but recently been put upon the market, it bids fair to become one of the most popular of Mr. Babbitt's manufactures.

The other articles made in this establishment are so widely known and so well appreciated that it is unnecessary to add anything to the universal verdict as to their merits. Potash balls, so well known in the market, originated in this establishment. One of the upper views in the engraving shows the workmen in the operation of pouring the fused potash into the iron moulds which give it its spherical form. Each ball, after casting, is given a protective coating of melted resin.

Saleratus, an important article of trade and commerce, is made in large quantities here. One of the lower views in the engraving represents the department in which this article is weighed and packed.

It is difficult, with a limited number of engravings, and brief article, to convey a just idea of the magnitude of Mr. Babbitt's establishment. The great success of this concern is due so the fact that Mr. Babbitt combines inventive and mechanical skill with business talent of the highest order. He has been enabled to originate new and valuable processes, and to devise labor-saving machinery, by means of which he has secured great advantages over his competitors.

Vehicles of Intelligence.

Newspapers, like nations, have a historical existence. They "go to and fro" in the world and exert a powerful influence. Tribes and individuals far removed from hearing what is transpiring among men are always ignorant and degraded. That person who uses means to obtain a record of passing events always improves and advances in knowledge; the man who is dead to such influences is dead to his own best interests. Well did the old Greeks know the value of obtaining new information. When voyagers and travelers came to their ports and cities they were taken to their public marts and requested to recite an account of what they had seen and heard abroad. The influence of this custom, before the art of printing was discovered, was like that of our modern newspaper; it tended to excite the people, and lead them to achieve reputation in all that was held worthy of being distinguished.

As attainments in the useful arts make men distinguished and nations great, we take occasion to solicit the favor of our constant readers in extending the circulation of a paper devoted to disseminating such information among the people as is useful and elevating. We urge our friends to give us their assistance in presenting the claims of the SCIENTIFIC AMERICAN to their acquaintances. We have no doubt but there are a great many mechanics, manufacturers, and others who would become subscribers were our paper brought to their notice, and its character and advantages pointed out by those who know it well.

SOME RECENT INVENTIONS.

Mr. Ernest W. Noyes, of Bay City, Mich., has patented an adjustable toe weight for horseshoes, which consists of a weight with a longitudinal dovetailed groove, which engages an inclined bar rising from the edge of the shoe. In the groove is a spring pawl adapted to engage holes in the bar, whereby it can be fixed at different points to adapt it to the throw of the animal's feet.

Upon elevated and other steam railways the platforms are usually fitted with gates, which are opened to permit passengers to pass out and closed when the train is in motion, and the signal to the engineer for starting the train is given by means of a bell rope when all the gates are closed. There is always a liability of the signal being given before all the passengers are off, and of the occurrence of serious accidents by starting the train too soon. Mr. J. Charles E. Ohlenschläger, of New York city, has patented an improved electric signaling apparatus, which prevents the signal from being given until all the gates are closed.

An improvement in button holes for boots and shoes has been patented by Mr. Benjamin L. Newhall, of Lynn, Mass. The invention consists in a process of re-enforcing button holes by inserting a blank coated with "compo" in the flap and setting it thereto by pressure, in the peculiar construction of the blank, and in the mode of combining the blank with the flap.

An improved oil cabinet, patented by Mr. James M. Thayer, of Randolph, Mass., is designed for the use of retail dealers in oils and other liquids, corporations, factories, etc., which allows the oil or other liquid to be drawn in any desired quantity and without drip or waste, and prevents any escape of odors into the room.

An improvement in loom shuttles has been patented by Messrs. Adna B. Roberts and Le Roy Lyons, of Manchester, N. H. The object of this invention is to furnish shuttle spindles so constructed as to hold the bobbin upon them when lowered into the shuttle, and allow the bobbin to be readily put on and taken off when raised out of the shuttle.

Messrs. Gideon B. Massey and Edward E. Spencer, of New York city, have patented an improved revolving shoe heel, which is so constructed that they will allow the curve of a French heel to be continued across the edge of the revolving part, and that will give no indication to a casual observer that there is a revolving part.

Minneapolis (Minn.) as a Milling Center.

The substitution of "St. Paul" for "this city," in a statement of milling operations at the Falls of St. Anthony, given on the authority of the *Pioneer Press*, of St. Paul (SCIENTIFIC AMERICAN, October 25), was the means of doing unintentional injustice to the rival city of Minneapolis. As a business center the latter has outstripped her older but less favorably situated sister; and now the mills of Minneapolis have, it is claimed, something like five times the capacity of those of St. Paul. When mills now building are finished her capacity will reach 15,000 barrels of flour a day. Another of her great industries is the manufacture of lumber, amounting to 200,000,000 feet a year.

Correspondence.

Ice Boat Propulsion.

To the Editor of the Scientific American:

Referring to the subject of the propulsion of ice boats by sails, recently revived, it seems to be accepted as a fact that such boats may travel faster than the wind, without any serious effort being made to solve the problem. It ought not to be mysterious to scientific men, and is only so because sufficient thought is not given to the matter.

The error in this question consists in considering the velocity of the wind at all, except as the means for producing the pressure by which the boat is propelled. Given the weight to be moved, power required to overcome inertia and friction, and speed desired, the extent of sail, surface, and the wind pressure required to propel the boat may be very nearly calculated. The principle is the same with all boats using sails, whether in water or on ice, the difference being that the power to propel a vessel in water is great, while but little power is required with ice boats. With vessels in water the result is a great weight moved slowly, or in other words, the pressure of the air, the power converted to the motion of the vessel, is represented by a comparatively low rate of speed. If it were practicable to spread sufficient canvas, a vessel could be propelled in water faster than the wind.

With an ice boat the conditions are changed: the weight is small compared to spread of canvas, and the friction slight, so that the power obtained, transformed to speed, gives a resultant velocity in some cases greater than the wind.

The wind pressure on a plane surface exposed to its direct action is much greater than usually supposed. From tables we find the pressure on such surface to be 2 lb. for each square foot, with wind moving 20 miles an hour, and with the velocity increased to 60 miles an hour the pressure increases to 18 lb., so that with an exposed surface of 1,000 square feet there will be a constant pressure of 18,000 pounds. This applied to force an ice boat forward must give great speed, and the boat rushes forward until the equivalent of the power is obtained in speed. The pressure due to the wind velocity being obtained, that velocity may be eliminated from the problem. As an example, suppose it requires a wind velocity of 20 miles, or a pressure of 2 lb. per foot, to propel the boat at the rate of 20 miles an hour. Now, suppose the wind velocity be trebled, the pressure then runs up to 18 lb., nine times that required before; we then have an actual force which must be expended to increase the speed of the boat until an equilibrum is established. The query that naturally arises here, is this: Will not the pressure cease the moment the boat exceeds the wind in speed? If air was a non-elastic fluid, that would be the result; but air is elastic; its pressure on the sails is due not only to its momentum but to its elasticity by compression against the exposed surface, and this elasticity is a constant acting force, which, exerted under the favorable conditions provided by an ice boat, gives the result of a great speed. Were this not so, there would be a limit to the size of vessels which could be propelled in water by wind pressure, and a large spread of canvas would have but slight advantage over a smaller exposure. This can be illustrated by a boat floating with the current of a stream: its speed could not be increased by wings projecting at each side; it would move forward with greater force, but at the same speed.

The same principle is seen in a turbine water wheel, the weight in that case taking the place of the elasticity of the air as a constant force. There is the same difference in character of operation between a current water wheel and a turbine as there is between an ice boat moving with a gentle breeze and one sailing under pressure of a high wind.

W.

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The Experience of an Early Inventor.

In a recent communication referring to our lately published article on conspiracies to nullify the patent laws, Mr. Thomas Shaw, of Philadelphia, gives the following particulars relative to the experience of one of America's earliest inventors. He says:

From the place where I am now sitting I can throw a stone into the small triangular lot once occupied by the little shop of Olivar Evans. I frequently see his grandson, who has in his possession the diary and the few other papers left by that celebrated inventor, who designed the greatest improvements in milling machinery known to-day. To him millers are indebted for the first great improvements that helped make the working of grist mills automatic. The *American Miller* says of him: "He was not only the pioneer inventor in American milling, but the pioneer millwright as well. Before his time there were no American names that could be classed as mill engineers. He stood alone, and for decade after decade his work on milling was the text book of millers and millwrights alike. Still but few are acquainted with the life of this great man."

In another place the same paper says: "Olivar Evans was born in Newport, Delaware, some time in the year 1755 or 1756. Little is preserved of his early history. His parents were agriculturists of respectable standing, who gave their son the advantages common to people in their station. At the age of fourteen Evans was apprenticed to a wheelwright. An anecdote is preserved which displays in his character even at this period the ardent desire for knowledge and that determination ever evinced not to let any obstacle interfere with the object of his pursuits. His master, an illiterate man, observing his apprentice employing his leisure evenings in study, through motives of parsimony forbade him using candles; but young Evans was not to be discouraged, for collecting at the close of each day the shavings made from his work, he would take them to a chimney corner and by their uncertain light pursue his evening studies."

The benefit of Olivar Evans' inventions in milling machinery in this country alone would reach over $100,000,000 a year in cheapening and improving flour, for he designed the elevator, the conveyor, the popperboy, the drill, and the descender; which devices are now variously applied in different mills, rendering the grinding of wheat into flour completely automatic, yielding better flour at less cost, and making 28 pounds of superfine flour more to each barrel than was made by the old method. He was the first inventor of the high pressure engine, the model of which is now in the possession of the Franklin Institute, of this city. Without this invention locomotives could not have been built. It made possible the building of railroads throughout all the world, and bestowed a benefit upon the human race so great that the entire wealth of the United States would only represent a fraction of it.

I could enumerate many other valuable inventions of this noble man, but we have at present seen enough to know his usefulness. Let us now consider how he was rewarded.

He made in his diary, May 21, 1809, the following record, which is copied verbatim:

"For 4 or 5 years past my mind has been agitated between hope and despair respecting the fate of 3 of my most valuable discoveries, one of which was for no less object than the navigation of the Mississippi against the stream. I had calculated that in some future day they would be worth millions of dollars annually to this country, yet I could see nothing but ruin to myself or any of my family who should attempt to put them in operation, and I had often thought of destroying all my papers relative to them, but hesitated.

"On the 1st of this month, May, in the Court of the U. S. for Penna. District, an opinion was delivered but not made final, which I consider as highly hostile to the rights of inventors of useful improvements and patent rights; indeed I am told that the judge had, a day or two preceding, declared a patent right to be an infringement of public right.

"Such doctrines from such authority determined me that patent rights were property too untenable to be worthy of the pursuit of any prudent man. That it was highly dangerous to leave my papers to lead any of my children or grandchildren into the same road to ruin that had subjected me to insult, abuse, and robbery all my life. I was then in my 54th year, and had in 3 years last done more to acquire permanent property by renouncing such pursuits and following regular business than in 30 years before.

"I went home, collected all my drawings, specifications, and explanations, which had cost me immense study and labor of mind, called my family together, declared that it was for their good I was going to destroy them, lest they might prove the ruin of any of them, and to enable me to pursue regular business the remainder of my life for their support. They all approved, and I laid them on the fire. Thus went the best half of my inventions."

I append the following certificate:

"A correct copy from a leaf in a diary of Olivar Evans.

[Signed] "OLIVAR EVANS WOODS.

"October 9th, 1879."

Mr. Evans was well aware of the value of his improvements, and his predictions in reference to the steam carriage were truly prophetic. In some of his writings, published in the early part of the present century, he remarks:

"The time will come when people will travel in stages moved by steam engines from one city to another almost as fast as birds fly, fifteen or twenty miles an hour; passing through the air with such velocity, changing the scene in such rapid succession, will be the most rapid, exhilarating exercise. A carriage (steam) will set out from Washington in the morning, the passengers will breakfast at Baltimore, dine at Phila., and sup in New York, the same day." How far these predictions are fulfilled we leave the reader to judge. Evans seemed to be in great need of assistance, and it is unfortunate that Pennsylvania did not make him some proper reward, in view of the great monetary advantages derived by the entire commonwealth from his inventions.

This they not only failed to do, but, on the contrary, when Evans ran his first steam wagon out upon a street (now in my view) and happening to run against an old wooden lamp-post, this same legislature was prompt to pass a vote of censure by enacting a law specially provided because of this accident, forbidding him and others from ever having any more such nonsense, as they called it. And this law stands on the statute to this day, let it be said to the disgrace of our modern legislature, many members of which have been enriched by, and all enjoying the comforts and privileges of, the great invention of this noble inventor, whose misery was augmented by his highest and best efforts, until in utter despair, after years of toil, he assembled his family, recited his burdens that had become unendurable, and then destroyed his models and papers, as recorded in his diary.

I cannot help noting here a few extracts from Olivar Evans' papers to his counsel, papers that would make some 20 columns of the SCIENTIFIC AMERICAN. In one paper he says: "I was reduced to such abject poverty that my wife sold the tow-cloth, which she had spun with her own hands for clothing for her children, to get bread with." In another paper he states: "I was left in poverty at the age of 50, with an amiable wife to support, for I had expended my last dollar in putting my Columbia steam engine into operation, and in publishing the 'Steam Engineer's Guide.'" In another paper he says: "All prudent inventors are deterred from risking the expense, encountering the difficulties, the opposition, the persecution, the derision, and the sarcasm until he does succeed; and afterward the calumny, the insult, abuse, and robbery of a wicked and unjust minority of the people, too powerful for him to withstand, and the great expense of the process of the law, amounting to complete denial of justice to all poor patentees who cannot bring a cause to trial, for if cast, the cost and expenses would ruin them. Of upward of eighty of my discoveries which might prove very useful, not more than six are in operation."

A poor inventor (and they are generally poor) may be likened unto a man in possession of ordnance without ammunition, and it does seem to be the height of folly and wicked beyond measure for railroad companies and other large corporate bodies, whose entire business depends upon mechanical invention, to combine together against inventors; since without invention there would be no railroads, the railroads should not unmake the inventor.

No amount of patent law can avail the inventor so long as it can be surrounded with a wall of provisions that takes years to penetrate, and only with golden ammunition.

The papers of Olivar Evans referred to contain much valuable information, and I hope you will conclude to publish them at some future time, and give this present matter place in your valuable paper.

The Broker's Agency.

In connection with the various questions raised concerning the agency of the broker and his responsibility, the decision rendered recently by the U. S. Circuit Court in this State, in the case of Grace *vs.* American Central Insurance Company, will be read with interest by the fraternity. It will be found in full in the October number of the *Law Journal.* The issue was a peculiar one. The insured had applied to N., an insurance broker, who in turn obtained the policy through A., another broker. Immediately following the usual cancellation clause was the provision making any other person than the insured, who might procure the insurance, the agent of the insured in any transaction relating to the insurance. Notice of cancellation was given by the company to A., and accepted. On the night following, and before the insured had learned of the cancellation, the property burned. The insured contended that the broker was not his agent to accept cancellation; that he had vested him with no authority other than to procure the policy; that A. was not his agent in any event, N. being the real party authorized to procure the insurance. He also insisted that such a construction of the clause, as would allow the broker to accept cancellation would be exceedingly unjust to the rights of policy holders, and that he was entitled to the benefit of a reasonable time, sufficient to learn the fact and cover the risk elsewhere.

Of course the main question turned on the construction which was to be given to the clause in question. Heretofore the popular interpretation of the provision, making the party procuring the agent of the insured, has been that this agency had special reference to his acts in obtaining the policy, or if anything farther were included it was of a general character relating to the whole business. But the court, in this case, accepted neither construction. On the contrary, it defined the scope of the agency by the immediate context. The stipulation was with regard to cancellation, and it was with special reference to this that the party procuring the insurance was made the agent of the insured. He was such agent for the purpose of accepting notice, and being made so by the contract, notice to him was notice to the insured, and operated from the time it was given, irrespective of any hardship which might result to the insured. It does not appear that in the opinion of the court this construction militated or was intended to militate against the agency of the party applying, in any matter of procuring the risk, but simply to confine it to such acts as would naturally belong to the relations between a company and the only party whom it knew in the transaction.

The decision, however, shows the important character of the trust which is reposed by the insured in the broker whom he employs. His responsibility is not ended, as is so commonly supposed, when the contract has been obtained and securely locked in the owner's safe. On the contrary, any subsequent matter which may arise in the case of policies framed like this one, which calls for a communication from the company, may revive that agency and make its dealings with the broker effectual. Should the latter prove careless or recreant, his employer must suffer, though doubtless not one in ten supposes he is vesting such authority in his go-between. The moral of the whole case is that parties employing brokers should see to it that they are placing their business in the hands of responsible men; not merely men who can drive the sharpest bargains and get their risks taken at the lowest rates, but who will thereafter continue to care for their interests. In thousands of contracts the position of the broker is made as truly fiduciary as that of the guardians of a savings or life insurance fund.—*Insurance Monitor.*

The Foreign Fruit Trade.

The condition of the foreign fruit trade of Philadelphia has rarely been livelier at this period than it is at the present date, says the *Confectioners' Journal.* Raisins have recently advanced 50 cents per box in consequence of recent severe weather on the coasts of Southern Europe. They now command $2.25 to $3 per box, and are coming in freely. The steamship Escurial arrived here from Malaga early last week, bringing 50,000 boxes. This is the busy season for raisins, owing to the demand for the holiday trade.

Oranges are coming in very rapidly, nearly all from Louisiana and the West Indies. A cargo of 300,000 has just arrived, consigned to the house alluded to. These came from the Bahama Islands, and hundreds of thousands are coming in every week. Oranges will continue to arrive in large quantities from Louisiana and the West Indies until December 1, when they will begin to arrive from Valencia and the Island of Sicily. Oranges from the latter places will come until next August. Oranges now sell for $18 and $20 per 1,000 wholesale.

Lemons are arriving in small quantities, and the supply is not what is desired. They are brought principally from Malaga, but after the 1st of December they will come from Sicily. About four-fifths of the lemons that come to this country are shipped from the Island of Sicily, and they will continue to arrive until next September. Lemons now sell for $5.50 per box of 350, wholesale.

The market is overstocked with domestic grapes, and California grapes are beginning to come in large quantities. Among the choice grapes are the white ones from Almeria, Spain, and they come in 50 pound kegs, and they, as well as the best California grapes, sell for $6 and $7 per package of 50 pounds. Malaga grapes come in moderate quantities, and sell for $6 and $7.50 per package of 45 pounds. It is thought the recent storms in Spain will increase the price of grapes about 40 per cent. White grapes will continue to arrive for the next three months.

Bananas are steady, and a very brisk trade is being done. An average of two steamship loads per week come to this port, and this firm imports an aggregate of 20,000 bunches per month at the present time, each bunch containing an average of 12 dozen bananas. They sell for about $2 per bunch. During last March the firm mentioned imported 50,000 bunches. The best months for importation are March, April, May, and June.

Cocoanuts are being imported in large quantities, and the confectioners in the city use up about 500,000 of them per month. One house (Croft, Wilbur & Co.) has a contract for 100,000 per month. They come from Jamaica, Cuba, and the Spanish Main, and sell from $37.50 to $50 per thousand.

Pineapples arrive in April, May, June, and July. They come from the Bahama Islands, and between 2,000,000 and 3,000,000 reach this port every year.

Railway Birds.

An engine driver on one of the Scotch lines reports that he has noticed that certain hawks of the merlin or "stone falcon" species make use of the passing of the trains for predatory purposes. They fly close behind the train, near the ground, partly hidden by the smoke, but carefully watching for the small birds which, frightened by the train as it rushes roaring past, fly up in bewildered shoals; the merlins then, while the little birds are thinking more of the train than of lurking foes, swoop on them from the ambush of the smoke, and strike them down with ease. If they miss, they return to the wake of the carriages and resume their flight and their hunt. They can, it seems, easily keep pace with an express train, and outstrip it when they please.

ALOES AS A DRESSING FOR WOUNDS.—Dr. Millet, a French army surgeon, recommends powdered aloes as a dressing for wounds, both as a means of favoring cicatrization and for closing them. It is said to relieve the severe pain of wounds almost immediately, and requires to be renewed only at long intervals.—*Boston Med. and Surg. Journ.*

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NEW MUSICAL INSTRUMENT.

The novel musical instrument shown in the accompanying engraving is called the autophone, and is manufactured by the Autophone Company, of Ithaca, N. Y. It is a wonderfully simple instrument for one that accomplishes so much. It requires no special skill to operate it, and one kind of music may be played as well as another. The instrument, as will be seen by comparing it with the hand which is operating it, is quite small.

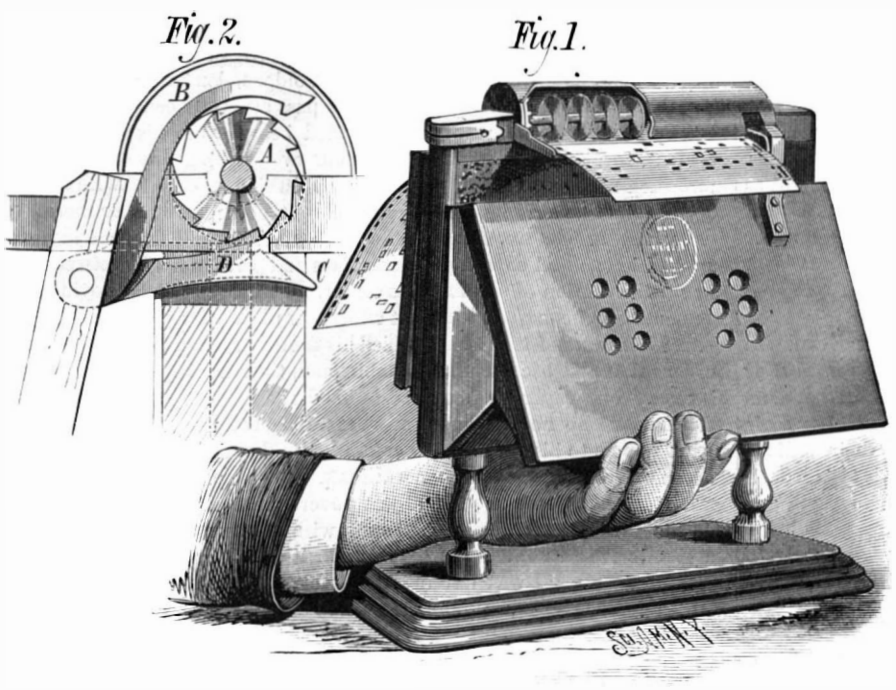
It consists of an upright rectangular board, having on one side a bellows, and upon the other a flexible air chamber, communicating with a set of reeds in the upper edge of the board. Above the reeds there is an apertured plate, and each reed has an aperture of its own. Above the plate there is a shaft carrying a series of thin disks, which serve to hold the perforated music sheet down upon the apertured plate. The shaft is pressed downward at each end by a spring, and carries at opposite ends toothed wheels which engage corresponding perforations in the music sheet.

The music sheet consists of a strip of Bristol board having perforations corresponding to the notes to be sounded. At one end of the shaft there is a ratchet wheel, A (Fig. 2), which is engaged by two pawls, B C, pivoted to an arm extending upward from the bellows. The pawl, B, always engages the ratchet wheel when the bellows is compressed, and the pawl, C, engages the ratchet wheel when the bellows expands, but it does not do so regularly, its movements being controlled by the arm, D, shown in dotted lines. This arm has a triangular projection at one end, which rubs upon the under surface of the edge of the music sheet and holds the pawl, C, out of engagement with the wheel, A, except at such places in the music sheet as are perforated to admit the end of the arm, D, when the pawl, C, will engage the wheel, A, and assist in moving it forward. This ingenious device is for the purpose of executing the quick notes, and to economize space in the music sheet.

As the music sheet is propelled by the regular working of the bellows, it acts as so many valves controlling the escape of air from the reeds and thus producing the music.

The most remarkable feature of this invention is the regularity and perfection with which the music is rendered. All of the parts are played, and the music is of no mean order. While it is a very amusing thing, it is also of very great utility, for those who are without musical talents can play as well as those cultured in the art, and many who would not feel warranted in purchasing an organ or piano can, at a very moderate outlay, provide themselves with both an instrument and a player. It must also prove of great use in schools and other places, as an accompaniment to singing.

Each instrument is provided with a number of perforated music sheets, and we understand that music adapted to the instrument can be furnished at any time.



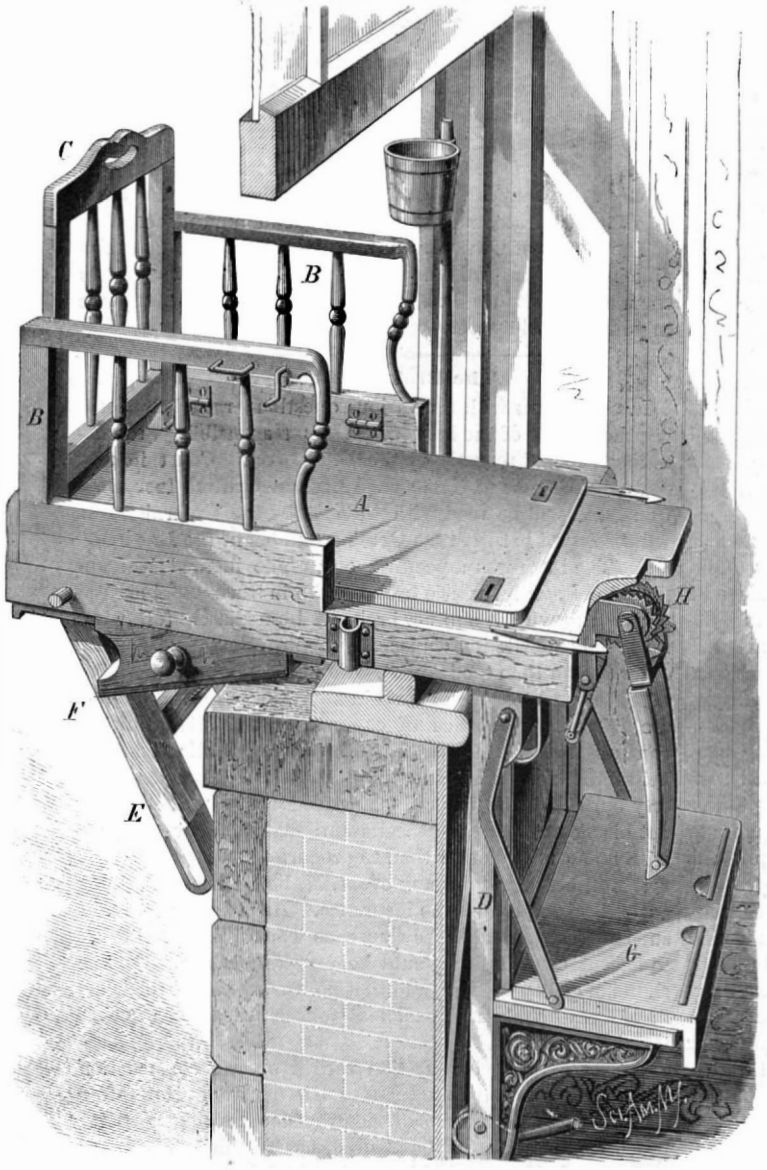
THE AUTOPHONE.

NEW WINDOW CLEANING CHAIR.

The great danger attending the cleaning of windows, especially in our high city houses, and the necessity of some means for guarding against the falling of servants while cleaning high windows, has led to the invention of the window cleaning chair shown in the annexed engraving. The inventor, Mrs. Henry Dormitzer, of 27 East 74th street, New York city, has received four United States patents on this device, and has also patented it in Canada, England, France, and Austria. The application of the chair will be readily understood by reference to the engraving. It is made adjustable, to adapt it to different kinds of windows, and when it is not in use it may be folded up compactly and laid away.

The platform, A, is of suitable size to sit or stand upon, and is provided with folding sides, B, and a folding back, C. When the sides and back are in the position shown in the engraving, they are retained in place by hooks. A frame, D, hinged to the front edge of the platform, supports the main step, and is provided with two eccentrics that are employed to press two springs against the wall to form a good bearing for the frame. The platform, A, is furnished at each side with a leveling wedge, F, which is moved out or in to adjust the bearing of the platform on the window sill. Below the platform there is a pivoted brace, E, that is drawn with more or less force against the outer surface of the wall below the window sill by a strong rawhide cord, wound around a small windlass, H, located under the front edge of the platform. This windlass is provided with an ingenious lever and pawl arrangement by which the lever, E, may be drawn against the wall with any reasonable amount of pressure. The lever, E, is adjustable and may be moved to accommodate the device to walls of different thicknesses. The inventor of this window cleaning chair has left nothing out that will increase the safety or convenience of the device. Means are provided for holding cups, pails, etc., in different positions, and an auxiliary step, which folds down upon the main step, may at any time be raised up above the platform, A, to facilitate reaching the upper portion of the window.

This device is easily and quickly applied to any window affording a safe support, and when it is not in use it is folded very compactly, so that it occupies but little room for storage.



WINDOW CLEANING CHAIR.

THE average amount of time lost to each laborer in Europe on account of sickness, according to Dr. Edward Jarvis, is from nineteen to twenty days each year. That among students is from two to five days. According to the Massachusetts Board of Health, during the year 1872, thirteen days' labor was lost by sickness for each productive person in the commonwealth.

AMONG the latest German patent applications there is one for the process of making a green color by oxidizing the sulphide of tetramethyldiamidotriphenylmethan.

Another Audiphone.

Professor J. W. Graydon, of this city, has for some time past been experimenting with a new invention called the audiphone, which is intended to supplant the old ear trumpet for use by the deaf. There has been an audiphone invented in Chicago, but Professor Graydon claims that his instrument is a great improvement upon that.

The audiphone, as constructed by Professor Graydon, consists of a small electro-microphone, to the center of the diaphragm of which is attached a cord, which may be of any length, and to the other end of which cord is attached a small piece of wood. The manner of working the instrument is very simple, and can be briefly described as follows. The deaf person takes a firm hold of the piece of wood between his upper and lower teeth, and the party desiring to converse with the deaf talks through the electro-microphone attachment at the other end of the cord, holding the cord taut. The theory advanced is that the sound is conveyed through the nerves of the teeth and the bones of the face to the auditory nerve, which, owing to some defection of the ear caused by disease, is not approachable through the usual channel, thence to the brain. The instrument will only work, however, when deafness has been caused by disease. In case of paralysis of the auditory nerve it is useless. Some very interesting tests of the audiphone were made at the deaf and dumb department attached to the Third Intermediate School recently. Among others was one, a bright looking colored girl, who was entirely deaf. The professor talked to her at a distance of twenty-five feet through the instrument, and she repeated after him everything which he said. Another was a little girl who had been deaf and dumb from birth. Using the mute alphabet she informed the teacher in charge that she could hear that one statement of the professor was made in a louder tone of voice than another, but that she could not understand what he said, never having been able to hear such sounds before. In some other cases, however, the pupils upon whom the instrument was tried said, in their mute language, that they were unable to distinguish any sound whatever. It is fair to presume that the instrument will, as have the telephone and microphone, be greatly improved, and that at no distant day it will be of great service to those afflicted by deafness.—*Cincinnati Gazette.*

How the Pennsylvania Railroad is Inspected.

The annual inspection of the Pennsylvania railroad by the executive officers of the company began October 22, the inspectors traveling in four special trains. The observation trains consist of an engine drawing a hotel and dining room car, and pushing a "gondola," that is, a low, open platform car, with seats raised in tiers, the superintendents occupying the first train, the civil engineers the second, the road supervisors the third, and the division foremen the fourth. Each gentleman is provided with a printed form, on which he marks on a scale of from 1 (very bad) to 10 (perfect) his estimate of each section of the roadbed. The verdict is reached by considering the condition of the track line, and the ballasting, ditching, draining, policing, and neatness of the work. When the trip is completed these cards are made up and an average struck for each section. The highest average indicates to which of the supervisors shall be given the first prize, usually a chronometer gold watch and chain appropriately inscribed, and to which of the division foremen the second prize shall be given. There is great competition for these prizes, and the system begun some ten years ago has been found to be of the greatest value in getting the best kind of work done on the roadbed and line of rail. Most of the superintendents on this trip have intimate practical knowledge of what constitutes a perfect road, for they have served the company of which they are now officers as roadmasters and division supervisors, winning experience and promotion in that way. Last year the inspection was extended over all the leased lines of the company, the superintendents passing over on their trip more than two thousand six hundred miles of the company's track. In doing this, however, they were not able to give the track that close scrutiny which the importance of their errand demanded.

Therefore this year the trip will be confined to the main line and its important branch, the Northern Central Railroad from Harrisburg to Washington and Sunbury. Last year the section south of Newark, a part of Superintendent McCrea's division, won all the prizes.

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The Cause and Prevention of Apple Rot.

Mr. C. H. Peck, the State Botanist, in his recently issued annual report to the Regents of the University of the State of New York, says:

While on the way from Summit to Jefferson, in Schoharie County, an apple tree was observed on which much of the fruit was discolored, and appeared as if beginning to decay. Some of the passengers in the stage remarked that they "never before knew of apples rotting on the tree." Some of the fruit was procured and found to be affected by a fungus known to botanists by the name of *Sphæropsis malorum*, or "apple sphæropsis." It has been described as attacking "apples lying on the ground" in winter. Here was an instance in which the apples were attacked while yet on the tree, and that, too, as early as September. The apples attacked by the fungus are rendered worthless, and experiments recently made indicate that the disease is contagious, and may be communicated from one apple to another. For example, a perfectly sound apple was placed in a drawer with one which was affected by the fungus. In a few days the sound apple began to show signs of decay. Its whole surface had assumed a dull brown color, as if beginning to rot. Two or three days later small pale spots made their appearance, and in the center of each there was a minute rupture of the epidermis.

An examination of the substance of the apple in these pale spots revealed fungus filaments that had permeated the cells of the apple. In two or three days more numerous minute black pustules or papillæ had appeared. They were thickly scattered over nearly the whole surface of the fruit. These constitute the sphæropsis. When microscopically examined each one of these black papillæ is found to contain several oblong pale fungus spores, supported on a short stem or foot stalk, from which they soon separate. It would be well, therefore, whenever this fungus rot makes its appearance, to remove the affected apples at once from the presence of the others, whether they are on the tree or not. It is not enough to throw them on the ground by themselves, for this would not prevent the fungus from maturing and scattering its spores. They should be buried in the ground, or put in some place where it will not be possible for the fungus to perfect itself and mature its spores or seeds. In this way the multiplication of the spores and the spread of the disease may be prevented.

TADPOLES.

The chief interest of the frog lies in the curious changes which it undergoes before it attains its perfect condition. Every one is familiar with the huge masses of transparent jelly-like substance, profusely and regularly dotted with black spots, which lie in the shallows of a river or the ordinary ditches that intersect the fields. Each of these little black spots is the egg of a frog, and is surrounded with a globular gelatinous envelope about a quarter of an inch in diameter.

On comparing these huge masses with the dimensions of the parent frog, the observer is disposed to think that so bulky a substance must be the aggregated work of a host of frogs. Such, however, is not the case, although the mass of spawn is forty or fifty times larger than the creature which laid it. The process is as follows: The eggs are always laid under water, and when first deposited, are covered with a slight but firm membranous envelope, so as to take up very little space. No sooner, however, are they left to develop, than the envelope begins to absorb water with astonishing rapidity, and in a short time the eggs are inclosed in the center of their jellylike globes, and thus kept well apart from each other.

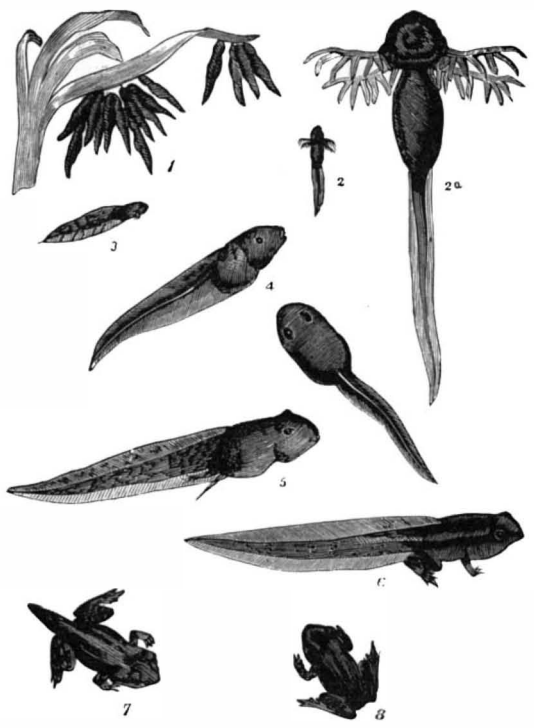
In process of time, certain various changes take place in the egg, and at the proper period the form of the young frog begins to become apparent. In this state it is a black grub-like creature, with a large head and a flattened tail (Fig. 1). By degrees it gains strength, and at last fairly breaks its way through the egg and is launched upon a world of dangers, under the various names of tadpole, pollywog, toe-biter, or horsenail (Fig. 2).

As it is intended for the present to lead an aquatic life, its breathing apparatus is formed on the same principle as the gills of a fish, but is visible externally, and when fully developed consists of a double tuft of finger-like appendages on each side of the head. The tadpole, with the fully developed branchiæ, is shown at Fig. 2 *a*, in the accompanying illustration. No sooner, however, have these organs attained their size than they begin again to diminish, the shape of the body and head being at the same time much altered. In a short time they entirely disappear, being drawn into the cavity of the chest and guarded externally by a kind of gill cover, as seen in Fig. 4.

Other changes are taking place meanwhile. Just behind the head two little projections appear through the skin, which soon develop into legs, which, however, are not at all employed for progression, as the tadpole wriggles its way through the water with that quick undulation of the flat tail which is so familiar to us all. The creature then bears the appearance represented in Fig. 5.

Presently another pair of legs make their appearance in front, as in Fig. 6; the tail is gradually absorbed into the body—not falling off, according to the popular belief—the branchiæ vanish, and the lungs are developed. Fig. 7 represents a young frog just before the tail is fully absorbed, and Fig. 8 shows the perfect frog.

The internal changes are as marvelous as the external. When first hatched, the young tadpole is to all intents and purposes a fish, has fish-like bones, fish-like gills, and a heart composed of only two chambers, one auricle and one ventricle. But in proportion to its age, these organs receive corresponding modifications, a third chamber for the heart being formed by the expansion of one of the large arteries,



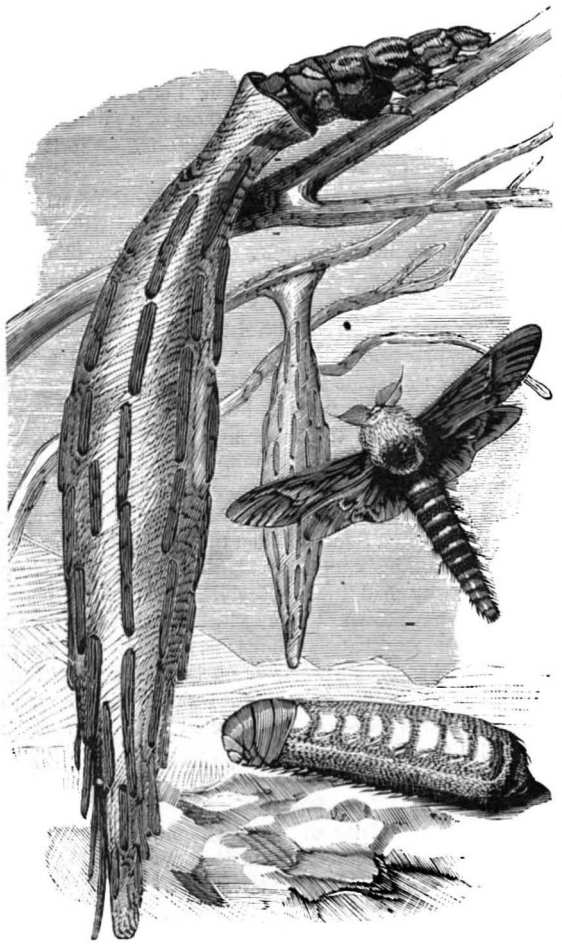
TADPOLES IN DIFFERENT STAGES OF DEVELOPMENT.

the vessels of the branchiæ becoming gradually suppressed, and their place supplied by beautifully cellular lungs, formed by a development of certain membranous sacs that appear to be analogous to the air bladders of the fishes.

HOUSE-BUILDER MOTH.

Perhaps the most curious example of the moth family is the species which is represented in the illustration, which we take from "Wood's Natural History."

The house-builder moth is common in many parts of the West Indies, and is in some places so plentiful as to do considerable damage to the fruit trees. As soon as the larva is hatched from the egg, it sets to work in building its habitation; and even before it begins to feed, this industrious



HOUSE-BUILDER MOTH.—*Oiketicus Sandersii.*

insect begins to work. The house is made of bits of wood and leaves, bound together with silken threads secreted in the interior. When the creature is small, and the house of no great weight, it is carried nearly upright; but when it attains size and consequent weight, it lies flat and is dragged along in that attitude. The entrance of this curious habitation is so made that the sides can be drawn together, and whenever the creature feels alarmed, it pulls its cords and so secures itself from foes.

In this domicile the transformations take place, and from its aperture the male insect emerges when it has assumed its perfect form, and takes to flight. But the female behaves in a very different manner. According to the ancient maxim, she stays at home and takes care of her house, from which she never emerges, nor indeed can she emerge, as she has no external vestige of wings, and looks more like a grub than a moth; the head, thorax, and abdomen being hardly distinguishable from each other. Love and courtship with this insect are carried on quite in an Oriental fashion, pushed to extremes; for whereas the Oriental in many cases never sees the face of his veiled bride until after the nuptial ceremony is completed, the house-builder never sees his mate either before or after marriage, and so is obliged either to love blindly or not at all. Perhaps, considering the peculiar ungainliness of his spouse, he is rather fortunate than otherwise in the fate which forbids him to contemplate the charms that lie hidden behind the dense curtain that shrouds the nuptial couch, and which, but for the mystery that surrounds them, might inspire any feeling rather than that of affection.

The grub-like female is seen lying on the ground, just below the flying figure of the male insect. It will be noticed that, except for the feathered body, the creature looks more like a larva than a perfect insect. Owing to the resemblance which these remarkable insects bear to the fasces which were borne by the lictors before Roman consuls, one species has been termed the lictor moth. The Singhalese appropriately call them by a name that signifies billets of firewood, and believe that the insects were once human beings who stole firewood while on earth, and are forced to undergo an appropriate punishment in the insect state. About five species of house-builder moths are known.

Injurious Insects Killed by Fungi.

It is a well known fact that various insects are subject to the attacks of parasitic fungi which prove fatal to them. The common house fly is destroyed by one, the silkworm by another, and the pupæ of various moths by others. Two other noticeable instances of this kind were observed last season by Mr. C. H. Peck, the State Botanist, and are described as follows in his "Report to the Regents of the University of the State of New York," just issued:

It was found that the "seventeen-year locust" (*Cicada septemdecim*), which made its appearance in the Hudson River valley early in the summer, was affected by a fungus. The first specimen of this kind that I saw was taken in New Jersey, and sent to me by the Rev. R. B. Post. Examination revealed the fact that the cicadas, or "seventeen-year locusts," in this vicinity, were also affected by it. The fungus develops itself in the abdomen of the insect, and consists almost wholly of a mass of pale-yellowish or clay-colored spores, which, to the naked eye, has the appearance of a lump of whitish clay. The insects attacked by it become sluggish and averse to flight, so that they can easily be taken by hand. After a time some of the posterior rings of the abdomen fall away, revealing the fungus within. Strange as it may seem, the insect may, and sometimes does live for a time even in this condition. Though it is not killed at once, it is manifestly incapacitated for propagation, and the fungus may therefore be said to prevent to some extent the injury that would otherwise be done to the trees by these insects depositing their eggs therein. For the same reason the insects of the next generation must be less numerous than they otherwise would be, so that the fungus may be regarded as a beneficial one. In Columbia county, the disease prevailed to a considerable extent. Along the line of the railroad between Catskill and Livingston stations many dead cicadas were found, not a few of which were filled by the fungous mass. As the insect makes its appearance only at intervals of seventeen years, and consequently will not be seen here again till 1894, it will scarcely be possible to make any further observations on it and its parasite for some time to come; yet it would be interesting to know how the fungus is propagated, or where its germs remain during the long interval between the appearance of two generations of the insect. Do the fungus germs enter the ground in the body of the larva, and slowly develop with its growth, becoming mature when it is mature, or do they remain quiescent on or near the surface of the ground, waiting to enter the body of the pupa as it emerges seventeen years hence? Or, again, is it possible that the fungus is annually developed in some closely related species as the "harvest fly" (*Cicada canicularis*), and that it passes over from its usual habitat to the seventeen year cicada whenever it has the opportunity? These questions are merely suggestive. They cannot yet be answered. A very good account of this fungus was given by Dr. Leidy, of Philadelphia, in Vol. V. of the Smithsonian Contributions, but as he bestowed no name on it, Mr. Peck has created a new genus for its reception and called it *Massospora cicadina*. The other instance of the destruction of insects by fungi is given by Mr. Peck as follows:

While in the Adirondack region, numerous clumps of alders were noticed that had their leaves nearly all skeletonized by the larva of some unknown insect. The larva were black in color and scarcely half an inch long. They were seen in countless numbers feeding upon the leaves, and threatening by their numbers, even if but half of them should come to maturity, in another year to completely defoliate the alders of that region. Upon looking under the affected bushes for the pupa of the insect, in order, if possible, to have the means of ascertaining the species, what was my astonishment to find the ground thickly flecked with little white floccose masses of mould, and that each one of these tufts of mould was the downy fungus-shroud of a

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dead larva from the alders. Not a single living pupa could be found, but there were hundreds of dead and mouldy larvæ, killed without doubt by the fungus, which is nature's antidote to an over-production of this insect, and nature's agency for protecting the alders from utter destruction.

Manufacture of Menhaden Fish Guano.

The menhaden belong to the herring family, and appear on our coast in the latter part of April, and depart in November. The business of catching the fish for oil and guano has increased rapidly within the last 18 years. It is carried on from Maine to New Jersey, and is especially prominent in the northeast portion of Long Island. In 1873 there were 62 factories in operation on the coast of New York and New England, employing 383 "sailing gear" and 20 steamers, with 2,306 men ashore and afloat. Total capital then invested, $2,388,000; total catch, 1,193,100 barrels, yielding 2,214,800 gallons of oil, and 36,299 tons of guano; value of products, about $1,600,000. Since then the business has largely increased, especially in northeastern Long Island.

Mr. Edward J. Boyd, in the *Rural New-Yorker*, gives the following interesting account of the mode of converting these little fishes into guano.

Omitting here an account of the manner in which the menhaden are caught, let us begin with them when they arrive at the "fish factory," as the place where they are converted into guano is called. This is generally a two story building with a "run," which is an inclined plane supported by trestle work, upon which a dump car runs to convey the fish from the boat to the "receiving tanks." These are situated outside the factory, and from them a sliding door opens to the tanks in which the fish are boiled. These are long, water-tight uncovered boxes, having in the bottom a coil of perforated pipe for the admittance of steam for the purpose of boiling the fish, and a plug hole through which the water in which they have been boiled can be drawn off. They will each hold from 50 to 5,000 barrels of fish. In the factories south of Montauk, L. I., the fish are counted by the thousand; in those east of Montauk, by the barrel, which is supposed to contain 250, four barrels thus making a thousand fish. These fish sold during the past season for one dollar per thousand. In a certain sense the business is a monopoly, as the owners of the different factories meet every year and decide upon the price to be paid during the ensuing season.

When a steamer or "sailing gear"—the name given to sailing vessels engaged in menhaden fishing—is sighted, the preparations at the factory begin. The tanks are filled half full of salt water; the "hydraulics," or hydraulic presses used to press the fish, are supplied with water, and everything is got into "ship-shape" order. On the arrival of the vessel, the fish are loaded into the dump cars by means of "tubs." These are the barrels by means of which the fish are counted. The freighted cars are then run up to the receiving tanks and unloaded; the slide is opened, and the cooking tanks are filled; steam is admitted and the process of cooking begins. When the fish have been "cooked," so that they fall readily apart, the water is drawn off; but, instead of being thrown away, it is conducted, by means of gutters, to an oil room situated on the ground floor of the factory. When the water has all been drawn off, a slide in the end of the tank is opened, and the pomace—the name given to the cooked fish—is raked into perforated cylinders, fitted with hinged bottoms, called "curbs." When these are full, they are set under the "presses," and hydraulic pressure is applied to them. The water and oil thus forced out through the perforated "curbs" fall on the floor, which is water-tight and divided by gutters leading to the oil room. After having been cooled there, the water, owing to its greater specific gravity, settles at the bottom, and the oil floats on top, and is skimmed off, like cream from milk. The oil is then placed in vats and boiled to free it entirely from water, after which it is put into bleaching tanks, where it is clarified, and then it is barreled.

The oil and water having been pressed out, the "curbs" are run into the "scrap" house and are emptied of their contents through the hinged bottoms. The fish is now worth $10 per ton as "green scrap." In from 24 to 48 hours a fermentation takes place, which produces a darker shade, caused by the escape of ammonia, and it is then called "old scrap." The next step toward "curing" it for the farmers now takes place by removing it to the "dry works," as the factory in which the fish is dried is called. Here the first process is "picking" it. This is done by putting it through the "picker," a cylinder armed with teeth revolving against set teeth, like the cylinder of a thrasher. The fish comes from the "curbs" in hard masses that sometimes require considerable exertion to break up; but when it comes out of the picker it is very fine—completely shredded.

The next step, "drying," now begins. This is effected either by the sun or by artificial heat. In drying by means of the sun, the scrap is spread out, early in the morning, on a platform, made like a floor inclined just enough to allow any rain that may fall on it to run readily off. During the day the scrap is constantly stirred by means of a wooden harrow drawn by a horse, until four o'clock, when it is gathered by means of a "loot." This is made exactly like a sled, but with a sliding tailboard, which is held down by the driver until the space between the runners is full, when it is lifted and the scrap laid off in windrows, like hay in the field. It is next gathered into the "cure," which is simply piling it into a heap, into which perforated pipes are inserted for the purpose of conducting away the latent heat that may be developed. Next day the "cure" is "turned;" that is, merely shoveled over and made into another heap. About four "turnings" generally cool the scrap enough to fit it for shipment. It is now worth from $35 to $40 per ton to manufacturers of fertilizers.

In rainy weather, "platform curing" is, of course, impracticable; so artificial heat is employed. This is a quicker process, but by its use about one-tenth more of the scrap is lost than by sun curing. The driers are revolving cylinders, like boilers, with shelves running spirally through them. A very hot fire is built in the fire box at the front end, and the heat passes under each cylinder to the back, and then through the cylinder to the front end, where stands the smokestack. The drier is fed at the front end, and as it revolves, the scrap is carried up by means of the shelves until it reaches the top, when, the shelves being inverted, their contents fall to the bottom, to be carried up again in the same way. Every time the scrap falls it falls a little further on in the cylinders, on account of its being pitched forward a trifle at each revolution of the drier, until, finally, it passes out at the back, and down a chute, to be caught up by means of elevators and deposited in the carts placed to receive it.

The length of time it takes a charge of scrap to pass through the drier, depends upon the length of the latter and the number of times it revolves in a minute. In a 25 foot drier, revolving eight times a minute, each charge takes about half an hour to reach the back end, during which time it alternately comes in contact with the hot cylinder and the hot air in it, all its moisture being thus evaporated. Very wet scrap requires from two to five dryings before it is ready for the "cure." The moisture is carried off by means of the natural draught, and with it go the fine particles of the scrap, a loss not incurred in platform drying; although a heavy thunder shower, when the platforms are "charged"—that is, covered with scrap—will wash away many dollars' worth of it. Indeed, I have seen four or five tons of scrap washed away by a heavy rain. After the scrap passes through the driers, it undergoes the "curing" process in the same way as "platform" scrap. Green scrap is mostly used for platform drying, and is very bulky when dried. Old scrap, too, is generally placed on the platform for 12 or 24 hours, if very wet, to dry the excessive moisture, because if it were put into the driers in its soaked state, instead of drying, it would make "pills," or round, hard balls. One "dry works" can dry he scrap from several "fish factories," as the fire is kept up constantly as long as operations last or there is work to be done.

For export, the scrap is ground and bolted. For this purpose a special mill is used—the only kind of mill that will grind the scrap so that it can be drilled in with grain. It has two cylinders, with cone-shaped bearing faces. One of these makes about 2,500 revolutions per minute; and the other, which is the feeder, about 800. Marvelous is the speed with which one of these mills grinds up the scrap. I have seen two men shoveling it in as fast as they could, while a torrent of ground scrap poured out like a stream of water. Pieces of iron, or anything short of a young anchor, cannot choke its greedy throat. The ground scrap is worth from $45 to $50 per ton.

The scrap will pay for the fish and the cost of working, leaving the oil a clear profit. A thousand fish, costing $1, will yield about five gallons of oil, worth 40 cents a gallon. This oil completely fills the place of "boiled oil" in the composition of paints. Nearly all the chemical and prepared paints are mixed with fish oil. Fish guano forms the base, or principal part, of the so-called complete manures, as well as of some sorts of Peruvian guano, etc., one ton of fish guano being "worked up" into six tons of many of the fertilizers sold to farmers. Sand and clay are the chief adulterations of fish guano. These make weight. Nothing, I believe, is so rich in ammonia as fish scrap, certainly not so far as the odor it emits is an indication. In my experience, on a Sunday when the platforms were being charged with scrap six months old, the windows of a church two miles away had to be closed. Fancy how persons stand it who have to work among it. But from my own experience, I can say that the odor is never noticed by a person after he has been a week or so in the factory; but so powerful is the perfume he carries about with him, that while he remains there, he is debarred from all social relations with the outside world.

Anti-Fat.

The subject of obesity and its treatment has of late years received much attention both from doctors and their patients. The interest excited by the appearance of Mr. Banting's "Letter on Corpulence" will not be readily forgotten. The medicinal agents most commonly employed in the treatment of this condition are acids—chiefly in the form of lemon juice and vinegar—strong alkalies, and iodide of potassium. Of late, however, a preparation known as "anti-fat" has been extensively advertised, both in this country and in America, possessing, if we may accept the statements of the proprietors, very remarkable powers in removing that superabundance of fat which is so frequently a source of anxiety and discomfort to those who indulge too freely in the pleasures of the table. Anti-fat is said to be a fluid extract of *Fucus vesiculosus*, a common sea weed, known in this country as sea wrack or bladder wrack, and in France as *Chêne marin* or *Laitue marine*. It is largely employed on the coasts of Scotland and France in the preparation of kelp; while in Ireland, curiously enough, it is found to be invaluable for fattening pigs. It contains, as might be expected, large quantities of iodine, chiefly, according to Gaultier de Claubry, in the form of iodide of potassium.

Fucus vesiculosus was at one time officinal in the Dublin Pharmacopœia, and is by no means a new remedy. Pliny describes it under the name of *Quercus marina*, and says that it is useful for pains in the joints and limbs. In the eighteenth century it was largely employed by Gaubius, Aunel, Baster, and others, in the treatment of scrofula, bronchocele, and enlarged glands, and even for scirrhous tumors. Its charcoal, known as *Æthiops vegetabilis*, was used in the same class of cases. The fucus has also been found useful in skin diseases and asthma. On the discovery of iodine, in 1811, by Courtois, the salpeter manufacturer of Paris, it for a time fell into disrepute. In the year 1862 its use was revived by Professor Duchesne-Duparc, of Paris, who, while using it experimentally in the treatment of psoriasis, found that it possessed the singular property of causing the absorption of fat.

The fucus can be taken either as an infusion, made by steeping half an ounce or a small handful in a pint of boiling water, or in the form of pill or liquid extract. The dose of the infusion is about a cupful, but it is so abominably nasty that few people can be induced to take it. The pills contain each three grains of the alcoholic extract; and, to begin with, one is taken in the morning, an hour at least before breakfast, and another in the evening, about three hours after dinner. The dose is increased by a pill a day, until the patient is taking ten every morning and evening. It is directed that the ten pills should be taken *dans la même séance*, and that a greater interval should not be allowed to elapse between each pill than is necessary for the process of deglutition. The fluid extract may be given in drachm doses, and it is said that the best results are obtained when both the solid and liquid extracts are taken. In favorable cases the sufferer may expect a reduction in weight of from two to five pounds in the week. Unfortunately, however, the fucus appears to be somewhat tardy in its action, and the patient should lay in a good stock of the drug before commencing treatment. In successful cases one of the earliest effects is an excessive diuresis, and the urine is said to become covered with a film of a beautiful nacreous aspect. In one carefully recorded case the patient did not observe this, but noticed that his water was very high-colored, and that its odor was extremely offensive. The next action of the drug is usually on the bowels, and the patient has many calls to relieve himself, without, however, being able to pass anything more than a little mucus. Sometimes the feet and body exhale a peculiar fusty smell, so that the patient is a nuisance both to himself and friends. After this, as a rule, the reduction in weight takes place. Occasionally, however, the opposite effect is produced, and the patient gets stouter than ever; in fact, fucus has been recommended as an "anti-lean."

By some authorities it is stated that the fucus should be gathered at the period of fructification, about the end of June, and that it ought to be rapidly dried in the sun; while other and equally eminent authorities insist that it should be gathered only in September, and that it should be allowed to dry slowly in the shade, a high temperature, according to them, destroying its active properties. It is generally agreed, however, that the roots and stalks should be rejected, and that the fucus gathered on the west coast is superior to that of the east. We understand that as a matter of fact most of our fucus comes from Billingsgate market, it being extensively employed for packing fish.

It must be confessed that we know little or nothing of the mode of action of this remarkable drug. We are told that it "stimulates the absorbents," but that is throwing very little light on the subject. What we want is a real sound systematic study of its uses and properties, both in the physiological laboratory and at the bedside. When it has been thoroughly and carefully worked out, as so many drugs have been of late years—pilocarpine and gelsemin, for example—we shall be able to form an opinion as to its value, but at present we are quite in the dark.—*London Lancet.*

Saws.

Much depends on the hanging and lining of a saw. First, examine with a straight-edge the collars; sometimes it will be found that the iron, around where the steady pins are driven, will be raised so as to cause a bunch around the pins; if so, either file or cut it off with a sharp cold chisel. A true mandrel will help a bad saw, but a bad mandrel will soon spoil a good saw. The mandrel must be level, so to allow the saw to hang plumb, and be as tight in the boxes as it will run without heating, and little or no endwise motion. (We are aware that the latter will not agree with all sawyers' views, for sometimes endwise or lateral motion has to be given to favor a bad saw, but we are alluding to saws that are in a proper condition.) The saw should hang on the collars so as to be perfectly flat on the log side. Most saws are thickest in the center, and for this reason the fast collar attached to the mandrel must be a little concaved and the loose collar may be nearly flat. This cannot be looked after too closely, as one half the portable sawmills that are made at the present day are just the reverse, and when the saw is hung it will be found too full on the log side. When this is the case don't try to run the saw until after the fast collar has been properly turned up.

There should be great care taken to see that the saw does not bind on the pins, or that the eye does not fit too tightly on the mandrel; if it does, the least warmth of the mandrel

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will be sure to cause it to expand, bind, and spring the saw. It is not expected that every saw will hang perfectly true, or all hang the same even on the same collars. Although the saws may be perfectly true, any deviation from perfection in the collars, or the saw, is multiplied as many times in the saw as the saw is larger than the collars. When a saw is found to be rounding or crooked on the log side, after fastening between the collars, loosen the nut and collars, and put a straight edge upon the log side of the saw and ascertain whether the fault is in the saw or in the collars. This should be done before it is used. Saws are often pronounced crooked when the fault is in the collars. We do not wish to be held responsible for the various shapes that bad collars may put a saw into; these imperfections may, however, be adjusted by packing writing paper between the saw and the collars.

The greatest care should be taken to keep the saw on a line with the run of the carriage. The saw should run nearly on a line with the carriage, the front of the saw inclining a little to the log, so that the back may rise without the teeth cutting or scratching the timber. A badly running carriage is ruinous to saws. The guides should be run as closely as they can without pinching the saw, so as to heat it on the rim and below the bottom of the teeth. It is not well to move the guides when the saw is warm, as the warmth may change its position. The practice of throwing water on the saw when warm is very bad, and should never be done. It may, however, be used to prevent pitch and gum from adhering to the saw—it keeps it clean and lessens the friction when used in a proper manner, and has no injurious effect on the saw. When used it should be applied on both sides, and put on when the saw is cool, near the eye, in a very small stream. The motion of the saw throws it over the surface to the verge, thereby producing the effect above mentioned.

Great care should be taken to keep the box next the saw from heating, as the heat is conveyed to the saw. The least heat in the center of the saw will make it limber and cause it to dodge. A saw that is in a proper condition should never have anything to cause friction in the eye, or on the rim, that can be avoided. The journal next the saw should not have any shoulders or collar to bear against the box, leaving everything free and clear. The mandrel can be as well and better secured with collars on the outside and inside of the opposite box.

The motion of the saw is one of the most essential things to be observed, and no one can give this too much attention. If the speed of the saw is too high, it cannot do good work, besides rendering it liable to many accidents. It generates heat in the saw, makes it touchy and limber, and it will only run and do good work on light feed, and while the teeth are in the best of order, and have a keen, sharp, cutting corner; as soon as this is gone the saw will run or dodge whenever it comes in contact with the least obstacle. And again: Too low a speed has its objections, but it is not attended with such ruinous effects upon the saw. These difficulties can be remedied to a limited extent by the hammering of the saw, but cannot be entirely overcome.

By carefully observing these rules respecting the care and attention due a circular saw, there will be labor and money saved. A circular saw is not unlike any other tool which has a great amount of work to do; it has its peculiarities, and needs to be kept in good order to do good work.—*Northwestern Lumberman.*

New Australian Railway.

A railway recently undertaken over the Mount Lofty range of hills, South Australia, will in years to come be regarded as one of the greatest engineering works at the Antipodes. However insignificant gradients of 1 in 45, and ascents of 2,000 feet may now be, any one who travels on the future line, or inspects the earthworks and tunnels as they are now being made, cannot fail to regard the line as a bold step for a small community to take. Nearly £750,000 will be spent on the 33 miles between Adelaide and Nairne. Within a trifle the railway is estimated to cost £22,000 per mile; and that, too, through a country where the cost of the land is a mere bagatelle. In some parts the expenditure will be fully £30,000 per mile, owing to the large amount of tunneling to be done and the height of the viaducts and embankments to be formed. The summit of the range will be reached in 18¾ miles from Adelaide, at a point about a mile to the west of Chafers, and at an altitude of 1,630 feet above sea level. Here a station, to be named after the range, the Mount Lofty Station, will be built. The ruling gradient, 1 in 45, will be between Government Farm and this point, and the descent from the summit to the Aldgate pump will be by a similar gradient. Powerful engines will have to be used, and they will come down to Mitcham without the aid of steam. The mountain section begins about Mitcham, and with but small exceptions the gradient is 1 in 50 until the Government Farm is approached. But in order to secure even this gradient creeks have to be crossed, steep hillsides hugged, mountains tunneled, sharp curves made, and ravines spanned by viaducts of great height.

The Largest Coastwise Steamer.

There was recently launched at Cramp's ship yard, Philadelphia, for Morgan's Louisiana and Texas Railroad and Steamship Company, the Chalmette, described as the largest coastwise vessel ever built in this country. She is 338 feet in length over all, 320 feet between perpendiculars, 42 feet beam, and 31 feet in depth. She has three decks and a cargo capacity for 8,000 bales of cotton. Her custom house measurement will exceed 3,000 tons.

With regard to machinery, she will have compound engines with high pressure cylinders 35 inches in diameter, and 70 inches diameter low pressure, with a stroke of 4½ feet. Four main boilers for 80 pounds working steam pressure. Her machinery is of an entirely new pattern. She will be provided with five independent cargo engines, two steering engines, two anchor, windlass, and capstan engines, together with quite a number of auxiliary pumping engines and pumps, and will be fully equipped for security against fire and sinking. Her appliances for handling freight are so complete that, it is claimed, only 30 hours will be required for discharging a cargo and receiving another.

Ice in the Arctic Regions.

Lieutenant Karl Weyprecht has lately given to the public an interesting work relating to ice and its metamorphoses in the Polar regions, from which the following, as given by Professor H. N. Moseley in *Nature,* is taken:

As an example of the mighty size of the Polar glaciers, the parents of the icebergs, the author cites the Humboldt glacier of Smith Sound, which, pushing itself into the sea in Smith Sound, forms an unbroken ice coast line composed of perpendicular cliffs 300 feet in height above the sea level and 60 miles in length, a single solid ice wall split only by vertical fissures. The fresh water ice is clear as crystal, and so hard that the Norwegian walrus hunters who run their small vessels in their voyages against all other ice obstacles, of whatever size, are careful not to charge even comparatively small pieces of this. This kind of ice is, however, scarce in the polar regions; it is the third kind of ice, that of salt water, or "field ice," which forms by far the greater part of floating ice, and with which the book is mainly concerned. The Tegetthoff was shut in for a year in field ice, and the author watched the incessant changes in the ice with great care throughout this period.

A simple smooth sheet of sea water ice is no sooner formed than it begins to be subjected to a variety of influences, which speedily convert its smooth expanse into a complicated rugged surface, covered with ridges, valleys, and irregularities of all kinds, render its thickness everywhere unlike, and split up with innumerable fissures. Most important among the causes of these changes are the variations of temperature to which the ice is exposed from the variation of that of the water below and the air above, and which are more or less local, and affect the ice differently wherever its thickness varies. From these differences of temperature ensue complicated strains in all directions, due to the unequal expansion and contraction of the mass, and the ice is rent by the tension; to these forces is added the pressure of surrounding ice fields, driven by the action of winds or currents; long fissures are formed, the edges of which grind together with mighty force.

After a while the edges separate, and the water between pulsates with the throbbing of the surrounding floes. Again they come together, and forced against one another with ever-increasing power, they are crushed and break up, huge blocks are piled above on the ice surface, resting at all angles upon one another, and other huge blocks are forced under the ice below. Hence the ice becomes rugged above, and by the freezing to it of the blocks forced under water, equally so below, the variation in thickness is increased, and with it the amount of strains caused by variation of temperature. The drifting snow hangs against the ridges and pinnacles on the surface, and forms banks and mounds which not only increase the effects due to temperature by protecting the areas on which they lie from change, but also by their immense weight, combined with that of the projecting ice masses by which they are formed, press down the ice which supports them, while the blocks below in other regions press it up. Throughout the mass gravity acts as a disturbant, no part being water borne at its natural level, the mass is strained, and gives way in all directions, and fresh complications ensue.

All these changes are accompanied by a noise. The unlucky prisoner in the field ice during the imposing unbroken loneliness of the long Arctic night, when the wind is calm, can hear the crackle of the snow under the stealthy tread of the polar bear at an astonishing distance, and hear what a man, speaking loud, says at 1,000 meters distance. It can, therefore, be well understood how the sound of the ice pressures must travel to his ear from enormous distances. "Sometimes," the author writes, "the noise of the ice movements was scarcely to be heard—a mere murmur—and came to our ears as does the play of the waves on a steep coast from the far far distance. Sometimes it hummed and roared closer to us, as if a whole column of heavily laden wagons were being drawn over the uneven ice surface." In the sound were combined all manner of noises caused by cracking, grinding, falling of blocks, crushing, and many other phenomena of ice life. "It is astonishing how far and how clearly every noise is conducted in the ice. The noise at the very margin of the field on which we were seemed to occur immediately at our feet. . . . If we placed our ears to the ice the sound was heard so loudly that we might have expected the ice to open under our feet the next moment. The whole dry ice covering was as a vast sounding-board. Whenever, as I lay down to sleep, I placed my ear against the dry wooden ship's side, I heard a humming and buzzing which was nothing else but the sum of all the noises which occurred in the ice at great distance from the ship."

A curious fact is described by the author, that the surface of an expanse of young salt water ice on which no snow has yet fallen is soft, so that the footstep is impressed upon its white covering as in melting snow. This is to be observed even at a temperature of —40° C. The unfrozen fluid is not water, but a concentrated solution of salt thrown out by the freezing of the ice beneath.

When summer begins, the thawing that occurs is very local and unequal. Any dark body, such as a heap of ashes, or the droppings of bears, eats its way into the snow, absorbing the rays of heat which are reflected off again by the general white surface. The bear droppings eat their way into the snow, and then into the ice, and the conical hole thus formed fills itself with water. It may, at last, eat its way right through the ice where not very thick. Thus are formed the greater part of those holes in drift ice which are usually ascribed to seals. The author never saw a seal's hole in winter.

A number of interesting experiments were made on ice phenomena. For example, on March 5, a cube of ice was sunk under the ice field to a depth of five meters. After the lapse of twenty-four hours it was found that a crust of new ice had formed itself over it about 1 cm. thick. This was caused by the low temperature of the block itself and, from a similar cause, ice crystals had formed between the edges of the hole, owing to the coldness of its walls. On March 10 very little increase in the added layer of ice on the cube was to be observed. On March 20 this newly formed ice was found to be softened, so that it was easily impressed by the finger; by April 2 it had become harder again, though porous and apparently a little increased. From thence onward the block dwindled regularly, especially on that part of its surface which was turned upward; on July 18 it was only a third of its original size; nevertheless, the hole through which it was sunk had, during the last period, become entirely closed by young ice at its lower margin. This experiment shows the loss of ice from below by the action of the warmth of the water. The author concludes from his experiments and measurements that compact salt water ice can never attain a greater thickness than 10 meters.

Icebergs are subjected to disintegration after somewhat the same manner as rocks so commonly are. They are full of crevasses, into which the water formed by melting penetrates; in winter this water freezes, and by its expansion all through the glacier a rupture of the mass ensues. "It is highly probable that most of the icebergs afloat in winter are in such a condition that a very slight cause is sufficient to make them burst because of their state of internal tension. . . . Every polar traveler can tell how a shot, the driving in of an ice anchor, or any other sudden vibration, has brought about the catastrophe; cases have even occurred in which the sound of the voice alone was sufficient. An iceberg is always an unpleasant neighbor." So many are the causes which tend to destroy icebergs that the author concludes "no berg exists which could withstand them more than ten years, and that commonly the life of a berg is much shorter." However this may be, doubtless the much larger Antarctic bergs last very much longer, as must necessarily occur because of the much greater uniformity of the climate to which they are exposed.

With regard to glaciers, the author quotes an interesting observation of Kane's to the effect that even in lat. 78° 20′ during the entire winter, however low be the temperature, the glacier streams never dry up. The melting which supplies them with water can only derive its requisite heat from the friction of the ice masses.

The chapter on the ice movements is full of interest Every field acted on by winds and currents has its own peculiar velocity, depending on the dimensions of the irregularities above and those of the resistances below, in which no two fields are alike. From these differences of velocity arise the irresistible pressures between contiguous fields. The iceberg deeply sunk drifts but slowly, while the ice field may travel very fast. If the field catches up a berg in its course, it is broken and torn by the berg; and as it proceeds on its course its broken fragments are piled up block upon block on the coast of the iceberg. To a casual observer it appears as if the iceberg, driven by a counter current below, were being forced in the opposite direction to the ice field, so as to plow it up. Many groundless accounts of the existence of such counter currents thus observed have been circulated.

Another cause of pressure between ice fields is that, owing to the irregularities on their surfaces, they are twisted round by the action of the wind, which takes hold more on some regions than others. Every field is differently thus acted upon for each direction of the wind. A similar effect is caused by the currents beneath acting upon the irregularities of the under surface. So various are the movements in the ice fields that even when the ice lies all the while closed, it is very seldom that any two pieces remain for any length of time in the same position alongside one another. Two ships beset together by the ice are sure sooner or later to be separated.

Charleston's Great Fire of 1861.

Mr. Wm. L. King, of Charleston, S. C., calls attention to an omission from the list of great fires, given in our issue of October 25. The most extensive conflagration from which Charleston has suffered occurred in 1861. It was the work of an incendiary, and swept over 540 acres of ground. There were 358 sufferers, many of them having more than one house destroyed.

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RECENT DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

By the U. S. Circuit Court.—Southern District of New York.

LICENSEES—NELSON *v.* MCMANN *et al.*—ELASTIC PACKING FOR JOINTS.

1. A party who, at best, is but a mere licensee cannot maintain an action for infringement in his own name.

2. The distinction between patentees, assignees, grantees of exclusive rights, and licensees, made by the law of 1836, and thereafter defined by the courts, has not been changed by the act of 1870. A licensee cannot sue alone in his own name.

By the U. S. Circuit Court—District of Connecticut.

HICKS *v.* MÖLLER.—BOTTLE STOPPER.

The patent (No. 48,300) granted to E. D. Moyer, June 20, 1865, for improvement for bottle stoppers, is not infringed by the device patented (reissue) to C. De Quillfeldt, June 5, 1877, the two devices being substantially different in construction and mode of operation.

By the U. S. Circuit Court—Northern District of New York.

GARRETSON *v.* CLARK *et al.*

1. Where the entire value of the whole machine as a marketable article is properly and legally attributable to the patented features, the profits may be estimated by showing the profits derived from making and selling the article containing the patented features and the profits realized from the manufacture and sale of other forms of the same article not embodying the patented features.

2. The burden is on the plaintiff to lay a basis by evidence for ascertaining the proper profits or damages, and it is not the province of the master, nor of the court, to suggest any specific line of proof as proper or necessary.

By the Commissioner of Patents.

TRADE MARK.

The term "Masonic" is not registrable as a trade-mark for cigars.

Although the noun from which this adjective was formed is old in our language, the adjective itself seems to have been contributed to the language by the order to which it applies, and its only meaning is "pertaining to the craft or mysteries of Freemasonry." Applied as a trade-mark to cigars it would be descriptive of the cigars, connecting them in origin, or use, or adaptation, with the Masonic order. The words Presbyterian, Methodist, or Roman Catholic, used as trade-marks for cigars, would stand on the same footing. Such words are not registrable as trade-marks.

TRADE-MARK.

The words "Granulated Dirt-Killer Soap" are registrable as a label, but not as a trade mark, for soap.

The word "dirt-killer" appears to be decidedly suggestive of a quality of the commodity to which the label is to be applied. In my judgment the registration of the words "Granulated Dirt-Killer Soap" as a trade-mark for soap might well be refused by the examiner, on the ground that the words are descriptive of the soap.

TRADE-MARK.

The name "Bob Ingersoll," associated with the representation of the bust and head of a man, is registrable as a trade-mark for cigars, Mr. Ingersoll having filed his consent, in writing, to the registration.

ALLEGATION OF EXAMINER.—HILL—TOY.

1. The applicant's affidavit is *prima facie* proof not only that he is an original inventor, and believes himself to be the first inventor, but also that he is the first inventor.

2. The mere allegation by the examiner that an invention has long been known and used in public, is not evidence of lack of novelty. It must be supported by affidavit, as provided in the rule of April 12, 1879.

BURGESS *v.* WETMORE.—MAGAZINE FIREARMS.

1. As against a prior applicant who had reduced the invention to practice before his application was filed, it is necessary for a subsequent applicant to show not only priority of conception and diligence in the prosecution of invention, but also a lawful reduction to practice.

2. A concession of priority is, under the rules, binding upon the parties to the concession, and also upon all the parties to the interference. But the rule goes no farther. It permits no party, by a concession, to fix the date of the invention of another party as against a third party to the interference. It renders no statement of foreign matter introduced into the concession legal evidence against anybody except the persons who make them.

3. The reduction of an invention to practice by a person who is not the inventor, nor the agent of the inventor, even though he may have derived his knowledge of the invention from him, is not equivalent to a reduction to practice by the inventor himself. The law accords the patent to the later applicant who connects by due diligence a prior conception, not with a reduction to practice by some one else, but with a reduction in practice by himself or his agent.

EX PARTE WINTHERLICH *et al.*—PROCESS OF MAKING DROP-SHOT.

1. A machine and its product cannot be joined in one application when they constitute different inventions; but when, being inseparable in their nature, they constitute one and the same invention, they may be so joined.

2. The applicant cannot be required to suggest considerations or proofs which shall establish these relations between the machine and the product beyond the possibility of reasonable doubt. It is enough if the reasons on which he bases his claim that the two are inseparable overbalance the opposing reasons in the judgment of the tribunals having jurisdiction of the case.

3. These reasons may be suggested by the laws of nature or by the testimony of witnesses. In cases of evident conflict between the two, the former must, of course, prevail.

EX PARTE CARTER.—MANUFACTURE OF RAKES.

1. In an application for a process patent every stage or sub-process distinctly claimed, which is capable of illustration by drawing, must be illustrated; but it is not, in general, necessary to illustrate by drawings the several steps in each stage of a sub-process claimed.

2. Where the applicant claims as a single sub-process the bending of the shank of a rake and the finishing of the shoulder at the junction of the shank and rake head, it is not necessary for him to illustrate, by drawing, the blanks with the shank bent but not compressed or finished about the head.

3. If a drawing of dies used in a sub-process can fairly be regarded as essential to such a description of the sub-process as will enable those skilled in the art to practice the invention, then a drawing must be furnished, although novelty in the construction of the dies may not be claimed.

EX PARTE DINKELBIHLER.—BRUSHES.

A claim for a rotary brush, with handles at right angles to each other connected by a frame, cannot be joined with a claim for a rotary brush with handles at the opposite ends of its axis, for the two sets of handles do not co-operate with each other, nor are they used either simultaneously or successively in the accomplishment of any result.

ACTIENGESELLSCHAFT APOLLINARIS-BRUNNEN *v.* SARATOGA SELTZER SPRING CO.—MOTION TO REOPEN INTERFERENCE.

1. The effect of sections 1,750 and 4,905 of the Revised Statutes is to authorize the Commissioner of Patents to establish rules for taking depositions before United States consuls in foreign countries. There is no other authority for taking depositions in interference cases. These statutory provisions do not execute themselves, nor provide for their own execution otherwise than through rules to be established by the Commissioner.

2. The rules for taking depositions in interference cases, now in force, do not apply to foreign countries.

MECHANICAL INVENTIONS.

An improvement in pitman connections, patented by Mr. Samuel Shiflett, of North River, Va., is especially adapted for use in connection with machinery for harvesting, where the reciprocation is rapid and frequent oiling is required; and it is also applicable to all kinds of machinery where a pitman or connecting-rod is made use of.

An improvement in washing machines has been patented by Mr. James Carroll, of San Francisco, Cal. The object of this invention is to provide a machine for washing clothes of all descriptions, but especially adapted for woolen clothes, because it will wash them without shrinking them.

An improvement in railway water-tanks has been patented by Mr. John D. Craig, of Vienna, Ill. The objects of the improvements are to prevent the freezing of the water in the tank from affecting the valve-stem and valve, and causing leakage and the consequent freezing and choking of the outlet-pipe; to prevent the bouncing and dancing of the valve when closed by the formation of a vacuum when the water is shut off; to adapt the outlet-pipe to the admission of the valve-stem, and to provide a hinged coupling for the extension of the outlet-pipe.

Mr. William H. Pilliner, of Elko, Nev., has patented a gold-washer and amalgamator of simple construction, designed for the purpose of obtaining gold, either in the wet or dry way, from the ores containing it. In this washer the particles of gold are rubbed into the quicksilver by the revolutions of a cylinder. A forcible contact is secured which must of itself very considerably increase the percentage of amalgamation, while the much longer exposure of the gold to the mercury, which is possible in this washer, adds still more to its advantage.

Mr. John E. Freeman, of Herkimer, N. Y., has patented an improvement in steam generators or boilers, which is so constructed that the steam will be generated very rapidly, and at the same time less fuel will be required than with boilers of the ordinary construction. It consists in the combination of cocks with the tubes connecting the tubes that form the vertical walls of the fire-chamber with the water-receiving chamber, and placed below the level of the fire-chamber, so as to be away from the heat.

Mr. Daniel Hubbard, of Oswego, N. Y., has patented a reaction turbine wheel, in which the wheel is surmounted by an air-chamber, and is set on the outside of a scroll-shaped flume that has a central aperture, through which the water is delivered into a corresponding central aperture in the wheel.

Messrs. Montague M. McGregor and James C. Croxton, of Rockwall, Texas, have patented an improved traction-engine for hauling freight upon roads and in other places, and for driving various kinds of light machinery. It is so constructed that the boiler will be held in a vertical position, whatever be the grade of the roadway, and that will cut off steam instantly at any desired point of the piston-stroke.

What We are Doing.

Probably never in the history of the world have mechanical invention and scientific discovery been brought to bear so universally and effectually to cheapen and improve the products of industry as in the past ten years. Especially has this been the case in this country, until, with our manifold labor-saving appliances, we have been enabled to place our wares in all the leading markets of the world, competing favorably with the poorly-paid and cheap hand-labor of the older countries. The iron and steel industries are wonderful examples of the progress made, every step, from taking the ores from the mine to the finished product in tool or machine, being cheapened by labor-saving inventions; while science comes in to utilize what was formerly considered worthless and magnify results in increased values.

Blast furnaces now turn out double the product of former years without increasing the size, and from many parts of the country we have been told that iron was made at from $11 to $14 per ton. Considering these facts, and the facilities now known of utilizing our abundant lean and cold short ores, many of our conservative and solid manufacturers look with alarm upon the persistent efforts of some of our dealers to "talk up" prices and urge a yet greater advance. If pig iron can be made for $14 per ton, or even at $16, it is thought that it would be best for the interests of trade that the prices ruling for the past few weeks should not continue. The price of iron, like the price of bread, touches vitally so many industrial interests of the world that an advance of from 75 to over 100 per cent, in the face of great reductions in the cost, cannot but react in disaster.—*American Manufacturer and Iron World.*

A Bridge of Old Rails.

The *Engineering News* states that a new iron bridge to carry the carriage road over the railway at the Intercolonial station, St. Johns, N. B., is, with the exception of the hand railing, which is made of cast-iron posts and gas-pipe, built entirely of old rail. The trusses are of the form known as the "bow-string." There are two roadways, each 13 feet wide, with sidewalks outside of trusses, each 5 feet wide, protected with iron hand-railing. The top chords of the outside trusses consist of two large T rails (weighing 70 lb. to the yard), and the bottom chord of two U rails, weighing 56 pounds to the yard. The center truss consists of three large T rails on top, and three U rails in the bottom chord. The diagonals between chords are U rails secured to chords with a wrought-iron fastening, riveted into the U, surged down and fitted with bolt and nut. The floor beams are made of T rails, riveted flange to flange, and secured to chords with angle iron. The floor consists of longitudinal floor timbers, covered transversely with three inch planks.

Air as a Stimulant.

The exciting and stimulating properties of pure oxygen are well known, and every one has felt the invigorating influence of fresh air, yet no practical application has been made of these beneficial properties of a substance so cheap and universal. When the body is weak, the brain fatigued, and the whole system in a state of lassitude, just go into the open air, take a few vigorous inspirations and expirations, and the effect will be instantly perceived. The individual trying the experiment will feel invigorated and stimulated, the blood will course with freshness, the lungs will work with increased activity, the whole frame will feel revivified, and nature's stimulant will be found the best.

Fever and Ague.

There are some situations where fever and ague prevails every season, and this is the case in the vicinity of creeks and swamps. An acquaintance of ours, who has resided for several years on one of these creeks, never has had a single case of fever and ague in his family, while all his neighbors have been more or less affected with it every season. He attributes his immunity from this troublesome disease to the use of a good fire in his house every chilly and damp night in summer and fall. When the Indians travel at night or early in the morning in swampy regions they cover their nose and mouth with some part of their garments to warm the air which they inhale, and this they say prevents chills and fevers.

New Method of Testing Milk.

In the *Chemiker Zeitung* we find the following method, invented by Mr. Ohm, of testing and examining milk without the use of any instruments.

About one ounce of good pulverized gypsum is mixed with a sufficient quantity of the milk that is to be tested to the consistency of a paste. By attentively watching the time that this paste requires to congeal or become set, the quality of the milk can be determined. If the milk has a specific gravity of 1,030 at 60° Fah., the mass will congeal in 10 hours, with 25 per cent of water in 2 hours, with 50 per cent of water in 1½ hours, and with 75 per cent of water in about 40 minutes.

The above results are confirmed by Prof. Reichardt, who will make further experiments to fully establish the accuracy of the above method.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Wanted—A good second-hand lathe to swing eight feet Address Stephen W Baldwin, 96 Liberty St., New York, giving general dimensions, weight, price, and other particulars

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa.

Surveying Instruments. G. S. Woolman, 116 Fulton St., N Y

The New Domestic Bible, with its 2,000 illustrations, is said to be a marvel of beauty and usefulness. A beautiful present for a friend or relative. Subscribers desiring a copy of the Holy Bible should consult the advertiser's special offer in this issue.

See Staples & Co 's advertisement of Non-Congealable Lubricating Oils on inside page.

Nellis' Cast Tool Steel, Castings from which our specialty is Plow Shares. Also all kinds agricultural steels and ornamental fencings. Nellis, Shriver & Co., Pittsburg, Pa.

Metallic Articles Colored in Single or Rainbow Colors. New Process. High cost metals imitated in cheaper metals. Gardiner M'f'g Co., Newburyport, Mass.

Hearing Restored.—Great invention by one who was deaf for 20 years. Send stamp for particulars. Jno. Garmore, 60 E. Sixth St., Cincinnati, O.

The Paragon School Desk and Garretson's Extension Table Slide manufactured by Buffalo Hardware Co.

For Superior Steam Heat. Appar., see adv., page 334.

Frank Miller's Leather Preservative and Waterproof Oil Blacking has no equal for softening, preserving, and rendering impervious to water, all kinds of leather.

Frank Miller's Original and Genuine Prepared Harness Oil Blacking contains no coal or mineral oils.

Shafting, etc.; specialty. P. Pryibil, 467 W. 40th, N. Y.

Perfection at last! Who will buy a Rotary Shuttle Sewing Machine? J. J. Green, Boonton, N. J.

Large Stock New and Second-hand Engines, Boilers, and Wood-working Machinery. Specify what is required. Belcher & Bagnall, 40 Cortlandt St., New York.

Power Hammers. P. S. Justice, Philadelphia, Pa.

Steel Castings, solid; act same as bar steel; Plow Shares; Crank Shafts; Dies; Hammer Heads; Pinions; Wheels; Cross Heads. All articles difficult to forge. Agricultural Wrought Steels. Read, McKee & Co., limited, Pittsburg, Pa.

For best Fixtures to run Sewing Machines by Power, address Jos. A. Sawyer & Son, Worcester, Mass.

Thomas D. Stetson, 23 Murray St., New York, serves as Expert in Patent Suits.

The Baker Blower ventilates silver mines 2,000 feet deep. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Wheelbarrows.—The "A. B. C. bolted" will outlast five ordinary barrows. $24 per doz. A. B. Cohu, 197 Water St., N. Y

Park Benjamin's Expert Office, Box 1009, N. Y. Recipes and information on all industrial processes.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

To Capitalists, Steam Fitters, Founders, etc.—Patent right for sale of new Steam Heat Radiator. Address, for particulars, J. N. Farnham, Waltham, Mass.

Steam Traps; best and cheapest in use. No blowing through to start. T. Sault, New Haven, Conn.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

The Secret Key to Health.—The Science of Life, or Self-Preservation, 300 pages. Price, only $1. Contains fifty valuable prescriptions, either one of which is worth more than ten times the price of the book. Illustrated sample sent on receipt of 6 cents for postage. Address Dr. W. H. Parker, 4 Bulfinch St., Boston, Mass.

Brass or Iron Gears; list free. G. B. Grant, Boston.

The Friction Clutch that is doing work in many places satisfactorily, that has never been done by any other, can be seen at Institute Fair, New York. D. Frisbie & Co., New Haven, Conn.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Wood-Working Mach'y. P. Pryibil, 467 W. 40th, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Steam Excavators. J. Souther & Co., 12 P.O. Sq. Boston.

Bradley's cushioned helve hammers. See illus. ad. p. 302.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel — other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery. Send for descriptive catalogue to Rowley & Hermance, Williamsport, Pa.

Portable Railroad Sugar Mills, Engines and Boilers. Atlantic Steam Engine Works, Brooklyn, N. Y.

Silent Injector, Blower, and Exhauster. See adv. p 334.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., manuf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Eclipse Portable Engine. See illustrated adv., p. 318

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

All makes and sizes of Steam Hammers bored out. L. B. Flanders Machine Works, Philadelphia, Pa.

Cut Gears for Models, etc. (list free). Models, working machinery, experimental work, tools, etc., to order. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

Valve Refitting Machine. See adv., page 269.

Blake's Belt Studs. The strongest, cheapest, and best fastening for all belts. Greene, Tweed & Co., New York.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 269.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Pays well on small investments; Magic Lanterns and Stereopticons of all kinds and prices; views illustrating every subject for *public exhibition and parlor entertainments.* Send stamp for 80 page Illustrated Catalogue. Centennial medal. McAllister, 49 Nassau St., New York.

RubberBelting, Packing, Hose, and all kinds of manufacturers' supplies. Greene, Tweed & Co., 18 Park Pl., N.Y.

Patent Steam Boiler Damper Regulator; most reliable and sensitive made. National Iron Works, New Brunswick, N. J.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

The New Economizer, the only Agricultural Engine with return flue boiler in use. See adv. of Porter Mfg. Co., page 270.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

For Pulley Blocks, write Block Works, Lockport, N. Y.

NEW BOOKS AND PUBLICATIONS.

A PRACTICAL TREATISE ON NATURAL AND ARTIFICIAL CONCRETE. By Henry Reid. New York: E. & F. N. Spon. 8vo, cl., pp. 384.

A third and enlarged edition of Mr. Reid's well-known work. The author traces historically the uses of concrete in architecture, discusses the nature of concrete, matrices, aggregates, stone breakers, and other machinery for reducing the aggregates, the treatment of aggregates, the silicating process, the established processes of concrete manufacture, English concrete industries, constructive concrete applications, important engineering concrete works, German Portland cement, the character of building materials, bastard mortar, a great variety of original experiments on concretes, etc. In the chapter on important engineering concrete works, it appears that the huge 70-ton blocks used on the Mississippi jetties are far from being the largest yet employed. In the works of the river Liffey improvement at Dublin, Ireland, concrete blocks weighing 350 tons each were successfully handled.

LECTURES ON ELECTRICITY IN ITS RELATIONS TO MEDICINE AND SURGERY. By A. D. Rockwell, A.M., M.D. New York: Wm. Wood & Co. 8vo, cl., pp. 99. Price $1.00.

Seven lectures on the theory and practice of electro-therapeutics, reprinted from the *Virginia Medical Monthly.* The ground covered embraces electro-physics, electro-physiology, electro-diagnosis, methods of application, apparatus for electro-therapeutics, the treatment of special diseases, and electro-surgery. The value of Dr. Rockwell's investigations in this department have been widely recognized by the profession, not only for their effect in extending the bounds of scientific knowledge, but in helping to reclaim from quackery an important department of medical study and practice.

COPYRIGHT AND PATENTS FOR INVENTIONS. Compiled by R. A. Macfie. Edinburgh: T. & T. Clark. Vol. I. 8vo, paper, pp. 406.

Contains an essay on the origin and progress of literary property written by Lord Dreghorn, nearly a century ago; evidence given to the late royal commission on copyright in favor of royalty republishing; and a large quantity of extracts, notes, and tables intended to further the national and international adoption of the royalty copyright system. The compiler is one of those zealous but belated individuals to whom the inevitable tendencies of civilization are a perpetual grievance. The increasing recognition of property-right in ideas, more particularly in invention, is Mr. Macfie's especial bugbear; and his persistent efforts to stay the course of modern thought and practice in this direction forcibly remind one of Mrs. Partington's attempts to sweep back the tide. His book contains much interesting though undigested matter, and is copiously indexed.

KING'S POCKET BOOK OF CINCINNATI. Edited and published by Moses King. Harvard College, Cambridge, Mass. Cloth, 35 cents; paper, 15 cents.

A particularly well made, handy, and useful account of Ohio's chief city. The information is well chosen and well put; and it is abundant.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) D. A.—The use of phosphorus alone in any form will not serve to stimulate memory, and we cannot advise its use in the way suggested. An active life in the open air in an occupation requiring the constant employment of the mental faculties, a temperate diet, and the avoidance of excess of any kind are among the best remedies.

(2) W. H. R. asks: 1. What is meant by a battery polarizing? A. When liquids are brought into direct contact with metals, and included in a galvanic circuit, they become decomposed by the action of the current, and this effect takes place even when the action is no longer visible to the eye. The component parts of the liquids, or, in other words, the products of decomposition, collect upon and cover the metallic surfaces which border the stratum of liquid, and thus a new electric difference or electromotive force arises between the metals, which tends to oppose the original electromotive force of the battery. Metals which are thus affected in respect to their electromotive force are said to be polarized, and the process is called galvanic polarization. 2. Will common sheet zinc melted and cast into a thick plate do for use in batteries? A. Yes, but the pure article is much better. Pure zinc may be obtained from metal dealers in this city. 3. What is the cartridge paper used in making an induction coil? A. It is tough manila paperwell calendered. Any smooth, strong paper will answer the same purpose. 4. Where can carbon be obtained? A. From electricians who advertise in our columns.

(3) D. J. E. writes. Please be good enough to decide a question by answering the following question: What is a miter? One party holds that the intersection of parallel lines at any angle is termed a miter. The other party claims the term miter can be only properly applied to the intersection of parallel lines at an angle of 45 degrees. A. Webster's dictionary says a miter "in architecture is an angle of 45°," and also that anything mitered is "cut or joined at an angle of 45°."

(4) J. B. B. asks for directions for polishing a horn to be used as a powder horn. A. Scrape the horn with a glass or steel scraper, then smooth with pumice stone and water applied with a piece of leather; then use rotten stone and water applied with a piece of canton flannel; finally apply whiting and water with a piece of canton flannel.

(5) A. G. asks how to silver plaster casts. A. Ordinary plaster models are covered with a thin coat of mica powder, which perfectly replaces the ordinary metallic substances. The mica plates are first cleaned and bleached by fire, boiled in hydrochloric acid, and washed and dried. The material is then finely powdered, sifted, and mingled with collodion, which serves as a vehicle for applying the compound with a paint brush. The objects thus prepared can be washed in water, and are not liable to be injured by sulphureted acids or dust. The collodion adheres perfectly to glass, porcelain, wood, metal, or papier mache.

(6) C. E. asks how to enamel iron hollow ware A. The enamel of iron hollow ware is made of powdered flints ground with calcined borax, fine clay, and a little feldspar. This mixture is made into a paste with water, and brushed over the pots after they have been scoured with diluted sulphuric acid and rinsed clean with water. While still moist they are dusted over with a glaze composed of feldspar, carbonate of sodium, borax, and a little oxide of tin. Thus prepared, the pots are gradually dried, and then the glaze is fired or fused under a muffle at a bright red heat. Oxide of lead, although increasing the fusibility of the glaze, impairs its efficiency, as it will not resist the action of acids in cooking.

[OFFICIAL.]

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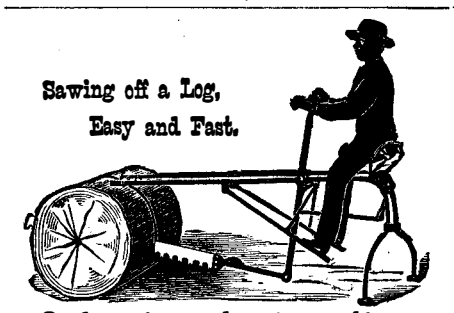

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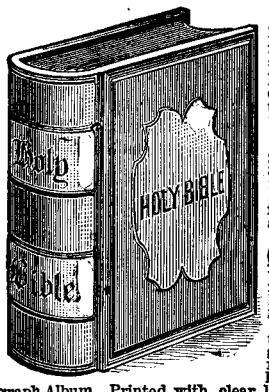

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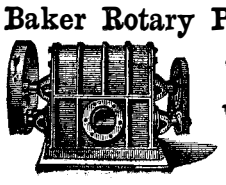

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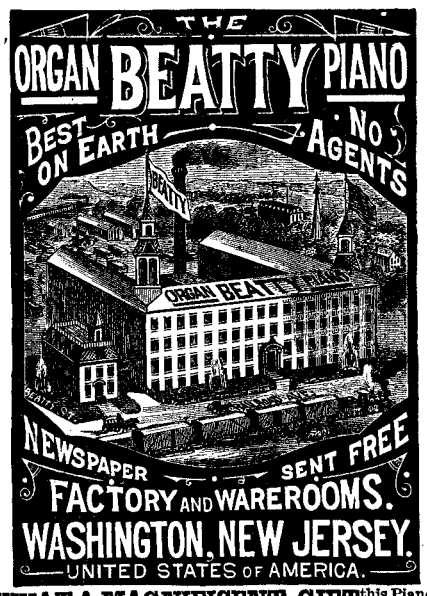

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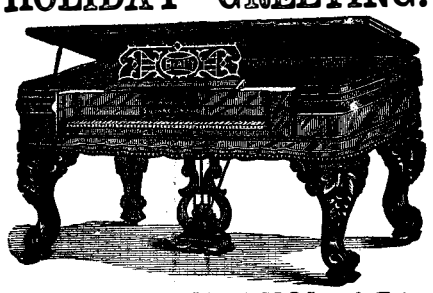

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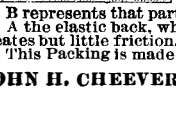

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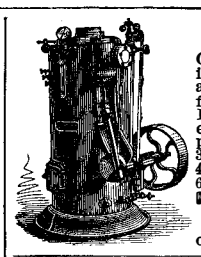

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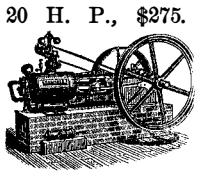

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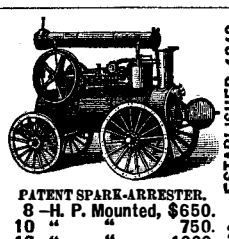

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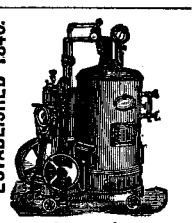

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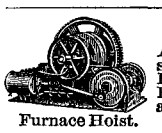

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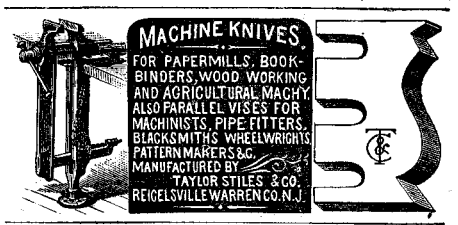
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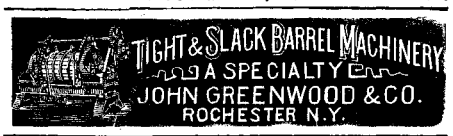

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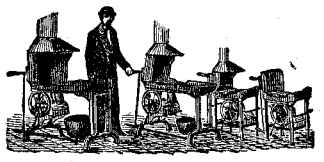

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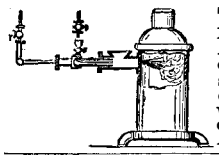

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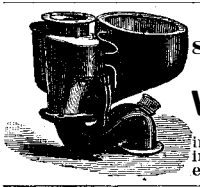

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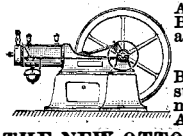

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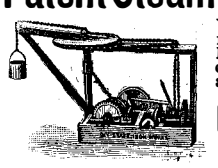

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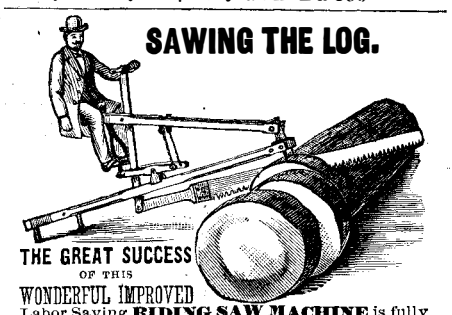

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